THE MOON TREATY

HEARINGS

BEFORE THE

SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

NINETY-SIXTH CONGRESS

SECOND SESSION

ON

AGREEMENT GOVERNING THE ACTIVITIES OF STATES ON THE MOON AND OTHER CELESTIAL BODIES

JULY 29 AND 31, 1980

Serial No. 96–115

Printed for the use of the
Committee on Commerce, Science, and Transportation

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1980

66-705 O

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

HOWARD W. CANNON, Nevada, *Chairman*

WARREN G. MAGNUSON, Washington
RUSSELL B. LONG, Louisiana
ERNEST F. HOLLINGS, South Carolina
DANIEL K. INOUYE, Hawaii
ADLAI E. STEVENSON, Illinois
WENDELL H. FORD, Kentucky
DONALD W. RIEGLE, JR., Michigan
J. JAMES EXON, Nebraska
HOWELL HEFLIN, Alabama

BOB PACKWOOD, Oregon
BARRY GOLDWATER, Arizona
HARRISON H. SCHMITT, New Mexico
JOHN C. DANFORTH, Missouri
NANCY LANDON KASSEBAUM, Kansas
LARRY PRESSLER, South Dakota
JOHN W. WARNER, Virginia

AUBREY L. SARVIS, *Staff Director and Chief Counsel*
EDWIN K. HALL, *General Counsel*
RONALD M. KONKEL, *Professional Staff Member*
JAMES J. GEHRIG, *Professional Staff Member*
WILLIAM M. DIEFENDERER, *Minority Staff Director*
GERALD J. KOVACHI, *Minority Staff Counsel*

SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE

ADLAI E. STEVENSON, Illinois *Chairman*

WENDELL H. FORD, Kentucky
RUSSELL B. LONG, Louisiana
ERNEST F. HOLLINGS, South Carolina
DONALD W. RIEGLE, JR., Michigan
HOWELL HEFLIN, Alabama

HARRISON H. SCHMITT, New Mexico
BARRY GOLDWATER, Arizona
NANCY LANDON KASSEBAUM, Kansas

CONTENTS

ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

AGREEMENT GOVERNING THE ACTIVITIES OF STATES ON THE MOON AND OTHER CELESTIAL BODIES

TUESDAY, JULY 29, 1980

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE,
Washington, D.C.

The subcommittee met at 9:30 a.m., in room 235, Russell Senate Office Building, Hon. Adlai E. Stevenson (chairman of the subcommittee) presiding.

OPENING STATEMENT BY SENATOR STEVENSON

Senator STEVENSON. The subcommittee will come to order.

The "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies" negotiated in the United Nations Committee on Peaceful Uses of Outer Space and endorsed by the General Assembly, is a significant proposed addition to space law. If signed and ratified by a substantial number of nations, it will establish new law governing the exploration of celestial bodies and exploitation of their resources. The agreement focused attention on resources and on the lack of a U.S. policy on further exploitation and use of those resources.

The purpose of this hearing is to gain better understanding of this agreement, particularly how it will affect future use of space, if it does become law.

Without objection, I will enter into the record at this point, a statement by Senator Cannon and also a copy of the agreement.[1] Several persons have been asked to submit testimony for the record and their testimony will also be entered in the record.

[The statement follows:]

STATEMENT OF HON. HOWARD W. CANNON, U.S. SENATOR FROM NEVADA

The "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies," was opened for signature by the Secretary General of the United Nations on December 18, 1979.

Late last year the committee commissioned three studies on this agreement: One with Mrs. Eilene Galloway, one with the Congressional Research Service, and one with the Office of Technology Assessment. The study by Mrs. Eilene Galloway has been completed and published as a committee print, along with the text of the agreement and other international documents important to an understanding of the agreement. The OTA study has been completed, and is being readied for publication. The CRS study is in draft form and will be completed in a few weeks and published.

[1] See "Agreement governing the Activites of State on the Moon and Other Celestial Bodies," parts 1 and 2, p. 85.

These studies form the basis for these hearings announced by the committee on May 30, 1980.

If this agreement is signed by the U.S. Government, then it must be sent to the U.S. Senate for advice and consent to ratification. Should that happen, it, of course, would be referred to the Foreign Relations Committee, which has jurisdiction over all treaties in the U.S. Senate, The Committee on Commerce, Science, and Transportation, however, has legislative jurisdiction over most civil space activities and oversight jurisdiction over all space activities. Therefore, to carry out its responsibilities, this committee must examine closely this new space treaty to assess how its provisions would affect the use of the space environment including the exploitation of extraterrestrial resources by the United States and other countries. Just as the committee reviews the scientific and technical aspects of our space programs, so it must review and keep abreast of changing space law.

These hearings, along with the reports commissioned by the committee, will establish the most comprehensive and reliable record available to date on this new agreement. The subcommittee is to be commended for holding these hearings to provide a better understanding of the provisions of the agreement and how it will affect the future use of space.

After studying this record, the committee may wish to hold additional hearings, commission further studies, or convene a conference or panel to further review this agreement.

With the conclusion of these hearings, the committee's interest in this agreement is not at an end. It will continue its interest in the treaty. Should the Government sign the treaty and send it to the Senate for advice and consent to ratification, the Committee on Commerce, Science, and Transportation will play an active role in the Senate's considerations of this agreement.

Senator STEVENSON. Our first witness is Mr. Roberts Owen, Legal Adviser to the Department of State. I invite all witnesses to summarize, if possible, their testimony. The full statements will appear in the record.

Mr. Owen.

STATEMENT OF ROBERTS B. OWEN, LEGAL ADVISER, DEPARTMENT OF STATE; ACCOMPANIED BY STEPHEN BOND

Mr. OWEN. Thank you, Mr. Chairman. I will summarize my testimony in about 15 minutes.

Some 10 months ago when I became the Legal Adviser to the Department of State, I inherited certain responsibilities with respect to the subject of today's hearing, an international agreement known colloquially as the Moon Treaty.

Secretary Muskie was invited to testify on this subject today, but because of the press of business, and because lawyers from my office have been intimately involved in the negotiation of the Moon Treaty since those negotiations began in 1972, Secretary Muskie has asked me to appear in his stead.

Let me begin with a word about the status of the Moon Treaty and the scope of my testimony. The treaty evolved through a lengthy series of negotiations in the context of the U.N. committee known as the Outer Space Committee. The treaty in its present form was approved by that committee about 1 year ago, and it was opened for signature by the U.N. General Assembly in December of last year. By its terms, the treaty will come into force when five states have ratified it. To date no state has ratified the treaty, but a handful of States have signed it, and it may come into force within a year or two. As you are aware, Mr. Chairman, the United States will not become a party to or bound by the Moon Treaty until our Government has signed and the Senate has given its advice and consent.

In recent months the Moon Treaty has become the subject of some controversy. For this reason the administration through an interagency task force has undertaken a careful study of the treaty and its implications for the future. In due course the task force will prepare a report, taking into account, among other things, the testimony of the witnesses who will be appearing during the present hearings, but I would not expect the executive branch decision as to approval or disapproval of the treaty until sometime next year.

That being so, I am not in a position this morning to say whether the executive branch will eventually decide to sign the treaty and transmit it to the Senate, but hopefully I will be able to give you some views as to certain legal aspects of the treaty and to submit some of the contrasting views as to its advantages and disadvantages, particularly with respect to the most controversial provisions of the treaty—namely, those bearing on the exploitation of the natural resources of outer space. Other witnesses from other agencies will deal with the arms control and scientific aspects.

Given the shortness of the available time, I am going to focus now on a few of the central issues relating to resource exploitation. At your invitation, Mr. Chairman, I have provided the subcommittee with a statement addressing these subjects, and I should now like to take about 10 minutes simply to summarize the essential points made in that statement. The controversial issues that I shall be addressing are essentially three: First, what are the arguments, pro and con, as to whether the United States should become party to a treaty which contemplates an effort in the future to establish an international regime to govern the exploitation of the Moon and other celestial bodies; second, what are the pros and cons of the Moon Treaty's reference to a concept known as "the common heritage of mankind;" and, third, what are the contrasting views as to whether the potentiality of exploitation of the natural resources of outer space by American free enterprise will be adversely affected by the United States becoming a party to the Moon Treaty?

Let me begin with the noncontroversial proposition that there are certain geographical areas on Earth and in outer space which should not be, and indeed are not, subject to claims of national sovereignty by the governments which presently exist on this planet. Two examples are the deep seabed under the Earth's oceans, and the Moon.

In regard to the Moon, the United States is already a party to a treaty—the 1967 Outer Space Treaty—which provides that celestial bodies are not subject to national sovereignty and that their exploration and use shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind. The 1967 Outer Space Treaty, however, does not provide rules explicitly devoted to the exploitation of nonterrestrial natural resouces, and the emergence of the Moon Treaty now presents the international community with the question of whether it would be desirable, some 15 or 20 or 30 years from now, to convene a conference to attempt to negotiate an international legal regime to govern such exploitation.

The most controversial provision in the Moon Treaty, article 11, explicitly provides for such a conference. It states, among other

things, that the Moon is not subject to national appropriation by any claim of sovereignty, that those nations which become party to the agreement will undertake to establish an international regime to govern the exploitation of the natural resources of the Moon, and that one of the main purposes of that regime will be an equitable sharing by all states parties of the benefits derived from these resources. An international conference to attempt to establish such a regime is to be convened among states parties to the Moon Treaty, at such time as the exploitation of the natural resources of the Moon is about to become feasible.

In short, although the treaty would require each state party, at some relatively distant point in the future, to negotiate in good faith toward the establishment of such a regime by agreement, no state will be legally obliged to agree to any particular form of regime, and any state which does not favor a particular form of international regime will be free to disassociate itself therefrom.

Turning to the most controversial portion of article 11, its first paragraph contains the following phraseology: "The Moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this agreement, in particular in paragraph 5 of this article."

Paragraph 5 is the provision which sets forth the undertaking to establish an international regime at some point in the future.

Now, what are the advantages and disadvantages of the United States adhering to a treaty incorporating such language? I would like briefly to summarize the arguments both ways, although my present oral presentation cannot do justice to either side because of the limitations of time.

As you are aware, Mr. Chairman, critics of the treaty emphasize that for the past 9 years most of the civilized nations of the world have been engaged in a continuing negotiation, under the auspices of the United Nations, looking toward the evolution of the so-called Law of the Sea Treaty. Although the negotiation of that treaty is not finished, the participants have evolved, on a tentative basis, a regime designed to regulate the exploitation of the deep seabed.

I should make it clear at this point, Mr. Chairman, that I am not an expert on the Law of the Sea negotiations, but I am aware of a school of thought which holds that the Law of the Sea negotiations to date have been tilted in favor of the Third World as against the developed nations, including the United States, and such critics point out with emphasis first, that the Law of the Sea Treaty refers to the deep seabed as "the common heritage of mankind," and second, that the seabed regime now being negotiated is an implementation of that concept.

Against that background the principal argument against the Moon Treaty is that, as a result of the Law of the Sea negotiations, the phrase "common heritage of mankind" has taken on a fixed meaning, particularly in the minds of certain less developed countries, and that, when the parties to the Moon Treaty sit down at a negotiating conference 15 or 20 or 30 years from now there will be those who will contend that because the Moon Treaty and the LOS Treaty each contain certain similar terms, such as "common heritage of mankind," the regime for the Moon must be essentially

similar to the seabed regime, even if that regime is then considered disadvantageous to the United States.

In response to these concerns, proponents of the Moon Treaty point out that the negotiating history of the treaty demonstrates that the negotiators did not intend that the common heritage concept had to have the same meaning and content in both treaties. In the Moon Treaty the common heritage phrase is followed by a clause which the draftsmen inserted with the specific intention of making plain that the phrase would have its own special and independent meaning in the Moon Treaty, quite apart from its meaning in other contexts. Accordingly, it seems very clear as a matter of law that at the Moon regime conference 15 or 30 years from now, the parties will have the legal right to devise a Moon regime which is altogether different from the seabed regime, if that course is considered desirable.

Despite that legal conclusion, critics of the Moon Treaty point to what they regard as the political probability that at the Moon conference of the future those who favor a seabed-type regime will be able to impose their will on the rest of the participants and that they will be materially assisted in doing so by being able to point to the use of common heritage and other terms found in both the LOS and Moon Treaty texts. Conversely, proponents of the Moon Treaty believe that it should be possible to persuade the parties at the conference to adopt a form of regime appropriately tailored to the needs of outer space and that, even if that effort fails, any dissatisfied party can decline to agree to an international regime and go its own way.

Mr. Chairman, these contrasting political predictions can lead to different conclusions as to what course the United States should follow. Those who believe that the common heritage principle in the Moon Treaty will lead to a politically unacceptable moon regime are strongly recommending that the United States refrain from signing and ratifying the Moon Treaty in the hope that such a result will be averted. Conversely, their opponents regard the development of a regime under the Moon Treaty as both desirable and inevitable, and they want the United States to adhere to the treaty, in order that we can participate in the shaping of the regime. The administration's interagency task force will be analyzing this basic issue as expeditiously as it can.

This brings me to what is probably the other principal concern about the Moon Treaty—namely, that because no one can now tell what sort of legal regime for the Moon will be developed at the future conference 15 or 30 years from now, it is not to be expected that in that 15- to 30-year interval American companies will be willing to invest the capital necessary to achieve private American exploitation of the Moon's resources. The uncertainties and the risks are too high, it is said, and in that sense the present situation is thought to create a de facto moratorium precluding American exploitation.

It is obviously undeniable that at the present time, whether or not the United States adheres to the Moon Treaty, there is great uncertainty as to what sort of legal regime will govern American exploitation of the Moon and that that uncertainty creates a degree of risk which will have to be assessed by American firms

considering such exploitation. Recognition of these uncertainties has prompted various suggestions as to how they might be mitigated, including one put forward by the American Bar Association's International Law Section as to certain clarifying understandings that might be included by the United States in its instrument of ratification. All of those suggestions are now being reviewed by the administration.

Whatever the results of that review, I think it should at least be recognized now that pending a Moon conference in 15 or 30 years—and whether or not the United States becomes a party to the Moon Treaty—American companies will have a continuing legal right to exploit the Moon's resources.

Mr. Chairman, that completes my introductory statement.

Thank you.

Senator STEVENSON. Thank 8ou.

Mq. OWEN. I would like to introduce Stephen Bond, Assistant Legal Adviser for United Nations Affairs, who can, I think, make a contribution.

Senator STEVENSON. Thank you.

Does the Department have a position on this treaty?

Mr. OWEN. It does not, Mr. Chairman, at the present time. That is the purpose of the interagency task force study. All of the responsible agencies which have an interest in the Moon Treaty are undertaking a study to evaluate the criticism which has recently arisen to see whether this criticism will alter the original feeling about the treaty.

Senator STEVENSON. You indicate that the phrase "common heritage of mankind" has a meaning that is independent of its meaning in any other law like the Law of the Sea. What is that meaning? How do you define that phrase?

Mr. OWEN. As used in this treaty, the term, I think, is a recognition that pursuant to the 1967 Outer Space Treaty, and as confirmed in the Moon Treaty itself, celestial bodies may not be appropriated by any state, that all states are to have access to celestial bodies and are to have the right to explore and use them without discrimination, and that the exploitation and use of celestial bodies is to be carried out in the interests of all countries.

In the specific context of this treaty, the term also means that those nations which ratify the treaty share an interest in the economic exploitation of the Moon and/or celestial bodies, an interest which is to be defined during the negotiations at a conference, as I mentioned, which will take place in the future.

The Moon Treaty explicitly states, as you have noted, that the term takes its meaning from within the treaty itself.

Senator STEVENSON. What does the phrase signify with respect to the ownership of these resources?

Mr. OWEN. The ownership principle is recognized in article 11 of the treaty, immediately after the reference to common heritage. It finds its articulation in a reference to natural resources "in place." This is article 11, paragraph 3.

That phrase was inserted in the treaty to make plain that although there can't be assertions of ownership of the resources of the Moon before they have been removed, once they have been extracted from the Moon, ownership can be asserted at that point.

The entire purpose of that phrase was to make plain that exploitation could go forward and that one can own what one can remove from the surface or the subsurface of a celestial body.

I might add, Mr. Chairman, that the negotiating history since 1972 makes it very clear that that was contemplated by the parties. The United States took the position from the outset that such exploitation should be permitted, that such ownership after extraction should be permitted. And that, I think, is an authoritative interpretation of the treaty.

Senator STEVENSON. One that is shared by other nations?

Mr. OWEN. One that I think perforce is shared by other nations because whatever their preferences may be, the negotiating history makes it very clear that that is the meaning of the treaty.

Senator STEVENSON. And what rights to exploitation exist pending establishment of the international regime?

Mr. OWEN. Again, Mr. Chairman, during the negotiation of this treaty, the United States took the position virtually from the outset that there should be no moratorium on the exploitation of these resources pending the establishment of the regime.

That statement was repeatedly made by the representatives of the United States. Others acquiesced in that proposition. I think virtually all the lawyers who have looked at the treaty and its negotiating history agree that during the interim, before the conference takes place in order to attempt to establish the regime, there will be no moratorium on the exploitation of these resources.

Senator STEVENSON. And what is the procedure for establishment of this regime? You mentioned a conference.

Mr. OWEN. Yes. There will be a review of the treaty in 10 years, at which time consideration will be given to the question whether exploitation is feasible or is about to become feasible.

If at that time it's found that either one of those conditions exists, then a conference will be held. If one-third of the states parties to the treaty call for a conference before that on the ground that they consider that exploitation is about to become feasible, and if a majority of the states parties concur in convening the conference then the conference can be called, and then all states parties will be obligated to sit down at the table and bargain in good faith, looking toward establishment of a regime.

Senator STEVENSON. How is the conference constituted?

Mr. OWEN. It would be a conference attended by those states which had theretofore ratified the treaty.

Senator STEVENSON. And a majority of those states would establish the regime?

Mr. OWEN. I take it that the conference, when convened, will establish its own rules of procedure. No one has undertaken to establish the rules of procedure in advance, which probably is wise; it probably is well to wait and see the conditions under which the conference is operated.

Senator STEVENSON. Would the agreement establishing the international regime which emerged from such a conference require approval by the Senate or could it be approved by executive agreement?

Mr. OWEN. It would be a major and important international agreement, if indeed one is reached, and it would have to be

approved by the executive branch and submitted to the Senate for its advice and consent.

There is no way that we can be bound by an agreement for such a regime without following those procedures.

Senator STEVENSON. And now, what is meant by the term "international regime"?

Mr. OWEN. It is a term which does not have any precise definition within the treaty. There are those who read it as meaning a new form of international institution, though I don't think that is a proper interpretation. I think it simply means a new rule of law, if you will.

It might consist of new rules of conduct governing the actions of states parties with respect to the exploitation of natural resources. I suppose it could, if that were thought desirable, involve the establishment of a new international institution to control the exploitation of these resources. But that was all left for the conference and for the states parties to decide under the circumstances that would then exist.

Senator STEVENSON. Are there any models of international regime available for possible application to this purpose, or that were envisioned in the agreement? Are there any models in existence now?

Mr. OWEN. Well, there are obviously institutions which presently exist and which might be considered at the time of the future conference to be worthy of consideration as models.

The opponents of the Moon Treaty feel that the Law of the Sea regime, when finally established, will be looked to by some as a model. There are various other institutions which might also be considered—Intelsat, Inmarsat, and institutions of that sort. They presently exist, and I am sure that by the time a conference is convened there will be other institutions which will be considered as possible models. Obviously none of those models would be controlling in any way, given the language of article 11, paragraph 1.

Senator STEVENSON. The agreement relates to the Moon and other celestial bodies within the solar system other than the Earth. Therefore, it thus related to the Sun.

Would it have any application to a solar-powered satellite?

Mr. OWEN. I think not, Mr. Chairman, for two reasons.

First of all, at the conclusion of its deliberations, the Outer Space Committee put forward certain understandings or interpretations as to the meaning of the treaty. One of those understandings made clear that the treaty would not apply to space objects in orbit around the Earth. I take it that a solar-powered satellite would be such an object.

Now, secondly, although it might conceivably be argued that solar energy is itself a natural resource, the language of the Moon Treaty makes it quite clear that such energy would not be a natural resource within the meaning of the treaty.

The treaty refers to natural resources in place on celestial bodies, and the report of the Outer Space Committee refers to natural resources which may be found on celestial bodies.

As I read it, that would exclude the Sun's energy. For those two reasons, I think that solar-powered satellites would be beyond the scope of the treaty.

Senator STEVENSON. Article 7 deals with the environment of celestial objects and says the states parties shall take measures to prevent the disruption of the existing balance of the environment of celestial bodies by preventing harmful contamination.

If a spacecraft lands on a celestial body, you would introduce to that body extraenvironmental matter which could be harmful or nonharmful, depending on your view, to its environment.

What is meant by "harmful contamination of a celestial body"? Would, for example, the mining of an asteroid with a 1-kilometer diameter change its environment? Would that be forbidden?

Mr. OWEN. Mr. Chairman, I think, on the second question, I would like to defer to the scientific experts who may be testifying after I do. As to the question whether mining would itself be permitted, I should point out that article 7, paragraph 1, provides that states parties shall take measures to prevent the disruption of the existing balance, and so forth—which, I take it, means that measures will be taken to minimize environmental harm—but it is quite clear from the negotiating history that that phraseology was not intended to preclude exploitation of natural resources.

Senator STEVENSON. We do have a few more questions. I think I will submit them in writing. We will not have time for all the witnesses otherwise.

Thank you both.

Mr. OWEN. Thank you, Mr. Chairman.

[The statement follows:]

STATEMENT OF ROBERTS B. OWEN, LEGAL ADVISER, DEPARTMENT OF STATE

Mr. Chairman and Members of the Subcommittee: I am pleased to have the opportunity to appear before you to address matters related to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, more frequently referred to as the "Moon Treaty." Secretary Muskie regrets that he was unable to represent the State Department at these hearings. However, as you are perhaps aware, State Department lawyers have regularly served on or chaired the United States delegation to the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (the "Outer Space Committee") since its creation as an ad hoc body in 1958, and it was in this Subcommittee that the Moon Treaty, the fifth treaty directly related to man's activities in outer space, was in large part negotiated from 1972 to 1979. The Treaty received the consensus approval of the Outer Space Committee on July 3, 1979, and it was approved by the United Nations General Assembly on December 5, 1979. Since then, France, Austria, Chile, the Philippines and Romania have signed the Treaty but have not yet ratified it. The Treaty will come into force once five states hae ratified it and thus become parties.

Over the past nine months the Treaty has been both criticized and supported by a broad range of interests. For this reason, when the Administration began to examine matters related to possible signature of the Treaty and its transmittal to the Senate, an interagency study of the Treaty was initiated to ensure that the various political, economic, and legal issues would receive the most careful consideration.

The study, which is still going forward, clearly should take into account the matters developed at the present hearings. Since the study is not complete, obviously I cannot now provide a definitive Administration position as to signature and ratification of the Moon Treaty, but perhaps my testimony will be helpful in clarifying, if not resolving, certain issues, particularly those of a legal nature.

The Administration's study will, of course, cover all aspects of the Treaty. During the current hearings, however, I would anticipate a division of subject matter as among those appearing for different Federal agencies. I would expect a witness from the Department of Defense to deal with those provisions of the Treaty relating to arms control, while Mr. Hosenball of NASA will concentrate on the institutional context within which the Treaty was negotiated and the issues relating to space exploration. My focus will be upon those aspects of the Treaty relating to the exploitation of non-terrestrial natural resources. It will be in this context that I will

take up those issues to which you referred in your letter to Secretary Muskie on June 17, namely, the State Department's interpretation and views on the Moon Treaty, the development of U.S. policy with respect to the Treaty, and our views of the "common heritage of mankind" concept. It is, of course, important that one keep in mind that the Moon Treaty is not limited to the exploitation issue, although that is the area which seems to have generated the most controversy. The arms control and space exploration provisions of the Treaty also contain elements of political, military and scientific significance to the United States.

1967 OUTER SPACE TREATY

Mr. Chairman, in the debate over the Moon Treaty, it is essential to bear in mind the existence and consequences of the first and most important treaty negotiated by the Outer Space Committee, the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, generally known as "the Outer Space Treaty." Because of the fundamental importance of this Treaty in assessing and understanding the Moon Treaty and U.S. positions during its negotiation, I wish to place on the record some specific language from the Outer Space Treaty, to which the Senate gave its consent without reservation and which has been binding upon the United States for the past thirteen years. I quote:

"The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind;

"Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality . . . and there shall be free access to all areas of celestial bodies;

"Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means;

"The activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty;

"In the exploration and use of outer space, including the moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the moon and other celestial bodies, with due respect to the corresponding interests of all other States Parties to the Treaty;

"All stations, installations, equipment and space vehicles on the moon and other celestial bodies shall be open to representatives of other States Parties to the Treaty on a basis of reciprocity."

The development of U.S. policy with respect to the Moon Treaty obviously had to be carried out within the legal context established by the Outer Space Treaty, which is not only legally binding upon us but also generally regarded as the cornerstone of U.S. space policy and vital to American interests in outer space. In fact, as is the case with the three outer space treaties negotiated immediately prior to the Moon Treaty, the Moon Treaty essentially represents an elaboration of the basic principles of the Outer Space Treaty. Against that background the present inquiry relating to the Moon Treaty should focus, presumably, on those areas where the Moon Treaty goes beyond the 1967 Outer Space Treaty in order to see how such provisions may affect the interests of the United States.

NEGOTIATING HISTORY AND OTHER BACKGROUND

My testimony will often refer to the negotiating history of the Treaty. This serves two purposes. First, the negotiating history of any treaty is obviously relevant to complete understanding of the treaty, and arguments either pro or con the treaty can be better analyzed and judged with knowledge of how the treaty text came to be what it is. As a legal matter, the preparatory work of a treaty and the circumstances of its conclusion are, of course, recognized by the Vienna Convention on the Law of Treaties to be a supplementary means of interpretation to be resorted to where the meaning of provisions is ambiguous or obscure. In this regard, the printing by the Committee on Commerce, Science and Transportation of Eilene Galloway's admirable study of the negotiating history of the Treaty and the Committee's intention to print, as part of the record of these proceedings, Professor Carl Christol's detailed article on the Common Heritage concept in the Moon Treaty are invaluable in enhancing a general understanding of the Treaty.

Second, in recent months there has arisen some controversy as to how the Treaty was negotiated. For example, accusations have been made that in June 1979 the U.S. delegation to the Outer Space Committee surrendered to a negotiating attack by the USSR and certain Less Developed Countries, with the result that the final Treaty represents essentially a Soviet-inspired text. The negotiating history of the Treaty corrects such inaccuracies and sheds light on other matters related to the Treaty.

The institutional context in which the Treaty was negotiated, i.e., the Outer Space Committee and its Legal Subcommittee, should also be understood, and Mr. Hosenball will discuss this aspect in detail. In this connection I will only say that because these bodies operate on the consensus principle, under which no proposal may be adopted over the opposition of a Committee member, the Moon Treaty contains no provisions which were included over the objection of the United States or any other country. Such a process obviously necessitates a certain amount of accommodation to the interests and desires of others, but it also enables each State, including the United States, to protect fully its essential interests during the course of negotiations. Whether the United States adequately perceived its interests in the Moon Treaty negotiations has been questioned by critics of the Treaty, but it should be understood that our negotiators were in no way forced to accept provisions in the Treaty by being outvoted by a Soviet/Third World majority. There was no voting.

Finally, Mr. Chairman, I will in my testimony make several references to the Law of the Sea negotiations, either noting difficulties which critics of the Moon Treaty have with these negotiations or pointing out differences or similarities between the LOS negotiations and the Moon Treaty. It would be impossible to adequately address the Moon Treaty and the views of its critics without such references. However, I am not an expert on the LOS negotiations and do not intend to comment on their substance. The views of the Administration on the LOS negotiations are well known, and nothing in my testimony should be taken as in any way altering these views.

Historically, discussions leading to the Moon Treaty commenced in 1970 when Argentina pointed out the Outer Space Committee's Legal Subcommittee that the use of the moon's natural resouces had already begun and that the 1967 Outer Space Treaty did not include specific regulations for this activity. Specifically, Argentina propoosed a "Draft Agreement on the Principles Governing Activities in the Use of the Natural Resources of the Moon and Other Celestial Bodies," Article 1 of which provided that the natural resouces of the moon and other celestial bodies should be the "common heritage of mankind."

While no action was taken in the Outer Space Committee on the Argentine proposal, less than one year later Soviet Minister of Foreign Affairs Andrei Gromyko requested that the 26th session of the U.N. General Assembly consider the "Preparation of an International Treaty Concerning the Moon." A Soviet draft text was submitted on June 4, 1971.

The United States was not enthusiastic about this initiative because we did not regard the Soviet text as consituting a significant advance in outer space law as it existed at that time. For example, the Soviet draft treaty gave little attention to the issue of exploiting natural resources. As the Soviet delegate subsequently explained, the "basic purpose [of the 1971 Soviet draft] was that there should not be included in the draft moon treaty a provision concerning the regime for the use and exploitation of the moon's natural resources." (Emphasis added.)

Nevertheless, a review of the Soviet text suggested to the United States that the Soviet initiative might be coverted into one which would positively carry forward U.S. interests. In particular, it was considered that there was potential benefit for the United States in having a Treaty which would cover all celestial bodies in the solar system, would mandate notification of intended activities on celestial bodies and the dissemination of information on their results, and which would lay the basis for a reasonable approach to the use of nonterrestrial natural resources.

INITIAL U.S. POSITIONS ON EXPLOITATION QUESTION

Regarding the matter of exploitation, the subject had occasionally arisen in the course of negotiations of the 1967 Outer Space Treaty, but no specific provisions on exploitation appear in the 1967 Treaty. The United States has long taken the position that Article I of that treaty, which provides that "Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States . . .," recognizes the right of exploitation. We were and are aware, however, that this view is not shared by all States or commentators, some of whom take the position that the nonappropriation provisions in Article VI of the 1967 Treaty preclude exploitation of celestial natural resources and their reduction to private property.

In 1972, then, the United States saw in the Soviet draft an opportunity to make clear that the prohibition against national appropriation of celestrial bodies contained in the Outer Space Treaty did not preclude the exploitation of non-terrestrial natural resources for any of three purposes: scientific investigation (such as the return of lunar samples to earth), the sustaining of missions of celestial bodies, and exploitation for commercial purposes. Thus, while the United States saw no urgent need for the Moon Treaty in 1972 (and, Mr. Chairman, this remained our view throughout the seven-year course of the negotiations), we did consider that important U.S. interests, including those related to exploitation, could be advanced via a Moon Treaty.

In discussion the development of U.S. policy on the exploitation matter, I wish to stress that the United States constantly maintained several themes, which I would like to set forth and illustrate through references to the negotiating history of the Treaty.

First, the United States was willing to accept the concept that the natural resources of celestrial bodies were the common heritage of mankind. Indeed, it was the United States which first proposed the phrase in the course of active negotiations. However, the U.S. view was—and is—that this concept embodies no substantive rules or a pre-determined form of legal regime, and the United States has consistently resisted efforts to give the phrase content which would be adverse to U.S. interests. In our view the phrase can acquire substantive meaning only by reference to the specific context in which it is employed.

Secondly, the United States has consistently rejected any suggestion that the Moon Treaty should impose a moratorium on unilaterial exploitation of nonterrestrial natural resources pending the establishment of an international regime; indeed, we have insisted that even after such a regime is established, the right of unilaterial exploitation will continue to be available to those States which do not choose to participate in such a regime.

Third, the United States has been aware of the vital role that American free enterprise can play in outer space, and the U.S. positions were designed to promote this role, both by ensuring that nothing in the Treaty would circumscribe this potential and by inserting into the Treaty certain rights which would be important to commercial exploitation by private or public entities.

Fourth and finally, our negotiators obviously were aware of developments related to the Law of the Sea negotiations; the two negotiations were somewhat parallel in time, and the two negotiating texts contain some common phraseology. However, the United States view was and is that the substance and meaning of the Moon Treaty should be determined independently of other international instruments and negotiations.

These were the principles which guided the United States when it inserted the exploitation issue into the Moon Treaty negotiations in 1972, Mr. Chairman. It is, of course, entirely proper to examine the Moon Treaty and its negotiating history in order to determine whether the final product adequately meets the objectives we set for ourselves at the commencement of negotiations. This is one reason for the Administration's on-going study of the Treaty and, I assume, for these hearings. Obviously there are those who believe that the Treaty falls short of our goals, just as there are those who believe they have been met. However, it should be clearly recognized that the three Administrations which approved the negotiating instructions on the Moon Treaty from 1972 to 1979, as well as to our negotiators, consciously took into account America's stake in outer space exploitation and the role private investment could play in such exploitation. As to the importance of these matters, I am sure that both critics, and supporters of the Treaty are of one mind.

1972 U.S. PROPOSAL ON EXPLOITATION

Returning to the negotiating history, the text on exploitation tabled by the United States during the very first negotiating round in April 1972 and the explanatory statement on this text by the U.S. representative, both of which may be found on page 14 of the Galloway study, are an excellent illustration of the U.S. approach to the exploitation issue. The 1972 U.S. text contained the statement (the antecedent to Article 11 of the Moon Treaty) that the "natural resources of the Moon and other celestial bodies shall be the common heritage of all mankind." Paragraph 3 of the U.S. text made reference to the need "for the encouragement of investment," and the U.S. statement made clear at that a conference to negotiate an exploitation regime, "participants would need to bear in mind not only common goals of economic advancement but the need to encourage investment and efficient development as well." Finally, paragraph 3 of the U.S. text recognized the possibility of such a conference being convened when practical utilization of nonterrestrial natural re-

sources had "already begun," making it clear that the establishment of a regime was not to be a precondition for exploitation.

Proceeding from this seminal text and statement, I would not like to turn to the key issues of "common heritage," moratorium, relationship to the LOS negotiations, and the role of private investment under the Moon Treaty.

THE COMMON HERITAGE CONCEPT

In advancing the "common heritage" concept in April 1972, the United States drew upon several sources: the 1969 Argentina proposal in the Outer Space Committee; President Nixon's 1970 statement on the seabeds; and also Brazil's November 1971 proposal in the General Assembly that the Soviet draft moon treaty be revised to incorporate the common heritage principle. The United States did not and does not believe that the common heritage concept carried with it substantial legal baggage. Our position in essence was that the common heritage concept would not prejudice possible future exploitation but would simply parallel and conform to established space law, especially Articles I and II of the Outer Space Treaty which already established that celestial bodies as a whole and all parts of them are areas beyond national sovereignty, to which all States have free access, and that activities in such areas shall be for the benefit and in the interests of all countries.

This is what lay behind the U.S. statement in April 1972 that "on broadest level of generality it seems right to state that such resources are part of the common heritage of all mankind." Given this context, it was therefore considered reasonable to agree that other States accepting the new treaty should be legally entitled to participate in future efforts to establish a legal regime to govern activities in such areas. If the common heritage notion has any legal content, it would be a "procedural" one, specifically that for areas with the characteristics I have just enumerated, it would be appropriate for the international community to attempt to elaborate an international regime. It has even been argued that within the legal context just described—a context established by the 1967 Outer Space Treaty—an acceptable international regime might well be vital in order to provide the requisite legal stability for commercial-scale on-site exploitation; otherwise, given the right of free access by all States to all areas of the "commons" and the absence of a sovereign power to assure order, such exploitation might not be possible. So too, such a regime could reduce controversies over activities in the "commons." Be this as it may, my point is that while the United States saw the convening of a conference to attempt to negotiate a regime as a reasonable outgrowth of a common heritage principle, the United States consistently resisted all efforts to establish the common heritage concept as embodying substantive rules or a pre-determined form of legal regime.

As fully discussed in the Galloway study and Professor Christol's article, from the introduction of the common heritage concept in 1972 to April of 1979, the Soviet Union adamantly rejected the inclusion of the concept in the Moon Treaty, citing various legal, philosophical and political difficulties with the phrase. One of the more interesting Soviet arguments was the "mankind" was not a proper subject of international law, only States were. This is, indeed, a standard Soviet position, one which is often used to oppose any notion that interntional law can provide individuals with human rights vis-a-vis their government.

Soviet opposition to the common heritage concept is not cited merely as a curiosity; it is useful in understanding the wording of Article 11(1) as it exists in the final text. During the informal negotiations at the 1978 Legal Subcommittee which resulted in the so-called "Austrian" draft, which subsequently was adopted almost unchanged as the Moon Treaty, the Soviets for the first time showed some flexibility regarding the common heritage concept; they insisted, however, upon an extremely qualified reference to the phrase, to wit "For the purposes of this Agreement, the moon and its natural resources shall be considered the common heritage of mankind, which finds its expression in the relevant provisions of this Agreement, and in particular in paragraph 5 of this article". The developing countries had difficulties with this language, but the final price of obtaining Soviet support for the Treaty was the retention of the phrase "which finds its expression in the relevant provisions of this Agreement, and in particular in paragraph 5 of this article." Thus, the intention behind the phrasing of Article 11(1) is exactly what the words imply, namely that the "common heritage" concept in the Moon Treaty finds its meaning solely within the Moon Treaty itself. On behalf of the United States, moreover, this interpretation was unequivocally set forth by Ambassador Petree in his statement of November 7, 1979, before the U.N. Special Political Committee as it debated the Treaty. This statement, on the record and uncontradicted, is legally authoritative as a matter of treaty interpretation under relevant international law.

Given the clarity of the legal position, it would be hard for anyone to argue that when the time comes to devise an international regime for the Moon, the inclusion

of the common heritage phraseology in the Treaty legally requires some particular type of regime. On the other hand, opponents of the Moon Treaty are not so much worried about possible legal requirements as they are about the practical consequences which they foresee as flowing from the use of the common heritage phraseology. They vigorously argue that, even though the common heritage phrase does not legally require any particular kind of Moon regime, nevertheless the phrase has taken on a particular meaning in the minds of some of those who will presumably be participating in the regime negotiations of the future. Specifically they argue that to many countries of the Third World the phrase "common heritage" essentially means common property and that such countries, when they come to the negotiating table, will do everything they can to force through a "U.N. style" international regime with one vote per state, under which any kind of unilateral exploitation of the Moon's resources would be forbidden on the ground that what belongs to all belongs to no one. In short, there are those who believe that, to the extent that the United States wants to retain the right to exploit the resources of celestial bodies, the inclusion of the common heritage concept in the Moon Treaty has brought about irretrievable prejudice.

There is, of course, an opposing point of view. Thus it can be argued with equal vigor that, when the parties to the Moon Treaty assemble 15 to 30 years from now to negotiate about an international regime, each party will bring to the table arguments favoring its own self-interest. Those whose self-interest will be advanced by reference to a particular definition of the common heritage concept will speak in these terms, and those whose self-interest will be advantaged by a different definition will argue to the contrary. Under this theory, in other words, any phraseology in the Moon Treaty which does not have legal consequences is really not going to control the course of future bargaining, which will in any event be governed by self-interest. Consistent with this theory the United States might be well advised to participate in any negotiations for an international regime in order to help shape the best possible regime—and refuse to agree to one that is unsatisfactory.

Conversely, the Treaty's critics think that, at best, a U.S. commitment to a negotiation that may not take place for 15–30 years is premature, and that at worst the terms of those negotiations are not likely to produce a satisfactory result. They argue that there is no pressing reason for the U.S. to endorse a long range approach to celestial resources based on politically-charged terminology which could skew the basis on which regime negotiations would proceed. They also question the degree of freedom we would have to walk away from regime negotiations taking place under a Treaty to which, by our adherence, we would have given greater respectability. This position is opposed by the strong school of thought which favors international cooperation as envisaged by the Moon Treaty and which sees heavy political and other costs in a refusal by the United States to become a party to a treaty because of objections to language supported by the U.S. during negotiations, particularly when that language only commits States Parties to negotiate, not to accept, an international regime. The bottom line, Mr. Chairman, is that with respect to the common heritage concept there are two strongly contrasting views as to the costs and benefits which would flow from United States adherence to the Moon Treaty. It is precisely because of these differences of view that the interagency task force is now proceeding with its study.

In connection with the question whether the United States should sign and ratify the Treaty, serious consideration could be given to the recommendation of the ABA's International Law Section, which proposes that the meaning of "common heritage" be clarified through the inclusion, in the instrument of ratification, of an additional explanatory, interpretation. Assuming ratification, I am not persuaded, pending further study, of the necessity of such clarification, but the substance of the proposal is generally satisfactory, subject perhaps to certain very minor modifications. For example, to my mind the common heritage concept affirmatively connotes that an effort will be made to establish a mutually acceptable international regime, and the Section's clarification does not mention the point. In any event, the desirability of an interpretive statement along the ABA lines will be carefully studied.

THE MOON TREATY AND LOS TREATY

Mr. Chairman, this line of discussion naturally leads to a broader discussion of the relationship—or lack thereof—between the Law of the Sea negotiations and the Moon Treaty. I have already noted that certain similarities do exist in terms of language, and, of course, both deal with the exploitation of natural resources in a "global commons," if that term may properly be applied to outer space. However, while the Law of the Sea experience, along with other examples of international efforts at cooperation, will be relevant, it is by no means clear that a future regime for nonterrestrial natural resources will, as a political matter, be decisively influ-

enced or controlled by the LOS regime, regardless of its merits. There are, after all, significant differences in the economic, political and legal contexts of the two potential regimes. I would like to point out three factors in this regard.

Most immediately, the LOS negotiations are almost completed, while negotiations for a regime to govern exploitation of celestial natural resources will not be undertaken until such exploitation "is about to become feasible" (Article 11(5)), i.e., at least 15–30 years from now. The lessons to be learned from the LOS experience will by then be available and can be taken fully into acount by the United States and other interested States.

The desire of land-based producers for particular conditions on the extraction of resources from the deep seabeds resulted from fear that these resources would be directly or indirectly competitive with resources they produce. However, this consideration will not necessarily be present in negotiations on a regime to govern celestial exploitation, in that it is the view of NASA experts that resources from the moon are, within currently foreseen economics, not competitive with terrestrial resources. The present thinking is that the value of lunar resources is predominantly in the reduced transportation costs for building structures in space or on the moon itself. The "producer/consumer" dynamics which have helped shape the LOS exploitation regime would not, therefore, automatically be transposed to another context.

Finally, the LOS treaty is not the only model for a future celestial exploitation regime. In outer space, the international community's experience with INTELSAT or INMARSAT would also be assessed, and in 15–30 years time other models of international cooperation will almost surely be available.

In sum, however difficult negotiations for the seabed regime have been, there are enough differences between the circumstances in which the LOS treaty is being negotiated and those in which the regime for extraterrestrial exploitation will be negotiated in some 15–30 years to preclude an automatic transposition of the results of the LOS treaty into the extraterrestrial context.

In this regard, it has been argued by critics that the Moon Treaty establishes vague terms of reference for a future negotiation—e.g., "common heritage," "rational management," "equitable sharing"—which many nations are likely to define in ways prejudicial to our interests. In the critics' view, the compromise which would emerge from this negotiation could thus be less satisfactory than if the negotiation began within a more favorable context. The argument the other way is that, as I have already stated, parties to the negotiations will argue their self-interest, and vague phraseology without legal content will not control the course of the negotiations. Moreover, the United States Government has declined to adhere to unacceptable international agreements, and there is no reason why we should depart from the great tradition in this context. Indeed, it may be argued that a failure by the United States to sign the Moon Treaty would give rise to the greater danger that a U.S. absence from the negotiations for a moon regime will lead to a significantly worse regime than would evolve if the United States participated.

LEGAL MORATORIUM

The next point I would like to address is the much-debated question whether the Moon Treaty establishes, as a legal or de facto matter, a moratorium on the exploitation of nonterrestrial natural resources, pending the development, through future negotiations, of an international legal regime.

The argument that there is a legal moratorium is generally based on two provisions of the Treaty. First, it is said that anything denominated as the "common heritage of mankind" can only be exploited with the approval of an international regime. It would therefore follow, according to this view, that no exploitation could occur until such a regime is established. Second, since Article 11(5) provides for negotiating an international regime "to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible," it is argued that a fair reading of this provision would be that a moratorium is imposed until the regime is established.

Again there are responsive arguments. The negotiating history of the Treaty, from the April 1972 U.S. text on through Ambassador Petree's comprehensive statement in November 1979, is replete with unequivocal statements by the United States that we would not accept a moratorium and that the common heritage concept did not imply a moratorium. Specific proposals for a moratorium were advanced by some States, were decisively rejected, and form no part of the Treaty. Moreover, Article 11(8) of the Treaty provides that "all activities" with respect to natural resources shall be carried out in a manner compatible with the purposes of the regime set forth in Article 11(7), and this provision was specifically included in the Treaty to establish principles which would cover exploitation carried out before

establishment of an international regime. Similarly, as the report of the American Bar Association's International Law Section has pointed out, Article 11(3) was drafted in such a way as to make clear that there should not be such a moratorium (Report at 6–7). According to the International Law Section, "No moratorium was either intended or established" (Report at 7). Quite the contrary: as made clear in Ambassador Petree's statement, the Treaty contemplates that the nationals of a State Party may exploit the resources of outer space outside the context of an international regime—either before such a regime is established or in the event a State chooses not to join an established regime. Conceivably, other States may claim that there should be such a moratorium, but there is no reason why such a claim should interfere with our right to proceed in accordance with our own understanding of the Treaty. The proposed clarification on this point suggested by the ABA's International Law Section is fully consistent with our understanding of the Treaty, although, again, we have not yet reached a conclusion as to whether, if the United States is to sign and ratify the Moon Treaty, it is really necessary to include such an interpretation in an instrument of ratification.

DE FACTO MORATORIUM

I think it is fair to say that the central focus of those who oppose American adherence to the Moon Treaty hinges on whether the Treaty creates a de facto, as opposed to a legal, moratorium on exploitation. The issue is necessarily difficult to analyze because it involves commercial, political and even psychological considerations projected into the relatively distant future.

Those who believe that the Moon Treaty creates a de facto moratorium draw upon lessons which they believe may be derived from the LOS negotiations and the involvement of American companies in ventures to mine the deep seabeds. It has been said that while the Moon Treaty does not foreclose the possibility that governments may one day undertake to exploit the resources of outer space, the Treaty limits or forecloses free enterprise initiatives in outer space because of the ambiguity of the "common heritage" concept and uncertainty over the powers and operating procedures of a future international regime, as well as the rules and regulations the regime will adopt to govern exploitation. It is argued that in an area that requires substantial investment in new technology, no private corporation would be willing to engage in the necessary 15 to 20 years of expensive R & D if there were a substantial risk that it would then be politically impossible for the company to enter the exploitation or commercial recovery phase of its project.

As part of our effort to assess this view, we have sought the views of major American aerospace and extractive industry companies and trade organizations. The replies thus far received are far from unanimous in support of this view—or in support of the Moon Treaty. About half of the respondents believe that the Treaty would inhibit free enterprise from exploiting nonterrestrial resources, while the other half support the position of the ABA's International Law Section, i.e., that the Treaty will be acceptable if its ratification includes the declarations and interpretations recommended by that Section.

In analyzing this issue the proper approach, I believe, is to recognize that the Moon Treaty exists and to address, as the key question, whether a de facto moratorium based upon perceived uncertainties about the future is more likely to arise if we adhere to the Treaty than if we do not.

Here again, there are different schools of thought which provide different answers. One is that if the United States refuses to become a party to the Moon Treaty at this time, and the Treaty fails to gain wide acceptance, especially among other space powers, this would reduce the likelihood that negotiations will be convened for an international legal regime under the Moon Treaty. This approach, it is argued, would leave the U.S. with the option of acceding to the Moon Treaty at a later date or pursuing other alternatives. The other school of thought expects wide adherence to the Moon Treaty. It is thus argued that because U.S. interests would be served by an acceptable, broad-based, international regime, the U.S. should put itself in a position to make such a regime acceptable through participation in the negotiations contemplated by the Moon Treaty.

Although a degree of uncertainty would exist between now and the time the regime is developed, such uncertainty would exist even without the Moon Treaty, and certain steps can be taken to reduce uncertainty if it in fact produces undesirable consequences.

Supporters of this point of view point out that in assessing the uncertainties of the future it should be borne in mind that, because of the efforts of American negotiators, the Moon Treaty contains rights which would be crucial to the successful establishment of a commercial exploitation operation. One example of such a right is that contained in Article 11(3). As explained at pages 6–7 of the Report of

the ABA's International Law Section, that provision was drafted so as to recognize the existence of property rights in natural resources moved or extracted from their original situs. While it is the position of the United States that this right also exists under the 1967 Treaty, our view is not universally shared, as I stated earlier, which means that adherence to the Moon Treaty would arguably provide us with useful reinforcement for the property rights involved. Moreover, as a Party to the Moon Treaty, the United States and its nationals would be in a far better legal position to block efforts by other States to deny us such property rights.

Similarly, Article 8 of the Moon Treaty specifically establishes a right to place equipment and facilities on or below the surface of the moon and forbids Parties from interfering with the activities of other Parties on the moon. This provision could be vital in assuring that the general rights to explore and use the moon and to have free access to all areas of celestial bodies (which rights are set forth in the 1967 Outer Space Treaty) cannot be utilized to interrupt or disturb exploitative operations by a Party.

Of course, if the United States does not adhere to the Treaty, American companies and financial institutions will eventually have to determine whether or not the 1967 Outer Space Treaty provides sufficient certainty for them to commit the tens of billions of dollars necessary for lunar exploitation.

We recognize that there are and will continue to be uncertainties as to the future of exploitation in outer space, and it may be that in due course Congress will wish to consider the unilateral enactment of national legislation establishing a legal framework for U.S. companies to engage in nonterrestrial exploitation. In this context an analogy to the Law of the Sea negotiating environment may be appropriate; the recently enacted Deep Seabed Hard Minerals Resources Act (Public Law 96–283) acknowledges a period of investor uncertainty and proposes certain government backing. If investor insecurity regarding celestial exploitation poses a problem and the government wishes to encourage early exploitation of lunar resources by private industry, passage of a comparable bill appropriate to the lunar context might be considered. Because negotiation of a lunar resources regime cannot be expected to begin for 15–30 years, the United States would have ample time to put into place legislation tailored to the task. Nothing in the Moon Treaty prohibits such legislation.

As to other methods of reducing future uncertainties and thus encouraging private investment in the exploitation of nonterrestrial natural resources, we are, as I have indicated, studying the desirability of attaching to any instrument of ratification understandings and declarations possibly similar to those proposed by the ABA's International Law Section, which are obviously directed at eliminating to the greatest extent such uncertainties about the future. While the Section's proposals have not yet been fully considered, it does appear that they are fully consistent with statements made by U.S. negotiators in the course of negotiations.

It might be useful to add at this point that, should such declarations and understandings be incorporated in an instrument of ratification, they would not be, as some have contended, merely indications of U.S. intentions and without a legal effect. As a matter of customary treaty law, if other State parties to a treaty do not contest such declarations within a reasonable time, the declarations become an integral part of the treaty relationship between the State making the declaration and each non-objecting State. If the declarations are contested by another State, and the objecting State feels so strongly about the matter that it wishes to avoid having a treaty relationship with the U.S. which would incorporate the U.S. declarations, then it must state that there simply is no treaty relationship between the State making the declaration and the contesting State. There are no circumstances under which the United States could be considered, as a matter of international law or domestic law, as having undertaken legal obligations inconsistent with Senate reservations or understandings. A U.S. domestic court could not construe our treaty obligations in a manner inconsistent with such qualifications, nor could an international tribunal.

CONCLUSION

Mr. Chairman, the report of the Senate Foreign Relations Committee on the 1967 Outer Space Treaty, the basic precepts of which I set out at the commencement of my statement, concluded with the following words: "In ratifying this treaty the United States will give up nothing; but we stand to gain much from this commendable effort to allow law and common sense to precede power and competition into outer space." American space policy has been guided from the beginning by the spirit expressed in the Senate report, and this was the spirit and policy guiding the United States during the seven years of negotiations on the Moon Treaty.

I have tried to explain what this and previous Administrations intended to accomplish by the Moon Treaty in the realm of exploitation of nonterrestrial

natural resources, and I have attempted to set forth what we presently regard as the proper legal interpretation of the Treaty. Although we have not completed our analysis of the Treaty, as I conclude my statement I would like to sum up these legal points very briefly.

I think it is generally agreed that the Treaty would place no legal limitations on the exploitation of celestial natural resources by any government or private entity beyond those already contained in the 1967 Outer Space Treaty; the only qualification would be that activities with respect to the natural resources of the moon must be carried out in a manner compatible with the environmental protections contained in Article 7 and with the purposes specified in Article 11(7). Although the latter provision speaks of "equitable sharing," we do not regard that reference as in any way diminishing the exclusive right of the United States to determine how it shares the benefits derived from exploitation by it or its nationals.

In regard to the international regime referred to in Article 11(5), neither the "common heritage of mankind" concept as embodied in the Treaty nor any other provision of the Treaty would legally require any specific form of international arrangement for the regulations of the exploitation of moon or other celestial body resources. Neither the Treaty nor the "common heritage" concept give rise to any specific obligation on States in regard to the establishment of such a regime except the commitment to engage in good faith negotiations to attempt to establish a mutually acceptable international regime to govern the exploitation of natural resources on celestial bodies when exploitation of such natural resources is about to become feasible.

While the common heritage concept in the context of Article 11 implies that every State Party to the Treaty has a significant interest in the possible future exploitation of nonterrestrial resources and that their views are to be given serious consideration at a future international conference to establish a regime, such an interest has long since been established by the legal principles incorporated in the 1967 Outer Space Treaty.

The Law of the Sea experience with the common heritage concept, while relevant, could not properly be regarded as legally controlling in the negotiations of any such future agreement on the legal regime. Article 11(1) of the Moon Treaty was intended to make clear that the common heritage concept in the Moon treaty finds its meaning totally within the text of the Moon Treaty itself. During future negotiations as to the Moon regime there will undoubtedly be efforts to draw on the Law of the Sea experience, and there may also be references to such other multinational cooperative ventures in outer space as Intelsat, an organization which itself establishes that the criteria set forth in Article 11(7) of the Moon Treaty can be met by institutional arrangements quite different than those contemplated in the Law of the Sea negotiations on seabed mining.

At any future negotiation to establish an international regime, there will, of course, be no legal obligation that agreement be reached at the conference or that the United States accept any results of the negotiations. The United States will be free at that time, as before, to assess the results against its own national interests and priorities. Any resulting treaty establishing an international regime specifically concerned with the exploitation of celestial natural resources would also have to be signed and presented to the Senate for its advice and consent before it would become binding on the United States. Refusal by the United States to accept any such international regime would not preclude either the United States or its nationals from unilaterally exploiting the natural resources of the moon or other celestial bodies.

I should add that many of the foregoing observations on the Moon Treaty are considered and supported by the very comprehensive and valuable study by the Office of Technology Assessment which was undertaken at the request of Senators Stevenson and Cannon, and is now nearing completion. For example, the OTA study observes that the common heritage provision was worded so as to preclude the definition of the concept from being controlled by external sources, that the Moon Treaty contains no commitment to conclude a new treaty, and that the Treaty cannot legally be interpreted as imposing a moratorium on exploitation.

Mr. Chairman, our study of the Treaty will continue with a view to reaching final conclusions as to whether the United States should become a party thereto or whether we should remain aloof. We continue to believe that "law and common sense" are criteria which have served the national interests of the United States, and we will proceed with our study in this spirit.

[The following information was subsequently received for the record:]

SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE,
August 13, 1980.

Mr. ROBERTS B. OWEN,
Legal Adviser, Department of State, Washington, D.C.

DEAR MR. OWEN: At the Committee's July 29th hearing on the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies," Neil Hosenball testified that the interpretation of the Agreement depended on the negotiating history as required by the Vienna Convention on the Law of Treaties and customary international law.

It has now come to the attention of the Subcommittee that the United States has not ratified the Vienna Convention, but that the United States has followed the principle that the interpretation of treaties depends on the negotiating history. Nevertheless, the absence of U.S. ratification of the Convention might be used as an argument against the position you have taken on the interpretation of the "Moon Treaty." The Committee would very much like to have your views on this matter which we propose to publish in the hearing record.

With every good wish.

Sincerely,

ADLAI E. STEVENSON, *Chairman.*

THE LEGAL ADVISER,
DEPARTMENT OF STATE,
Washington, D.C., September 12, 1980.

Hon. ADLAI E. STEVENSON,
Chairman, Subcommittee on Science, Technology, and Space, Committee on Commerce, Science, and Transportation, U.S. Senate.

DEAR MR. CHAIRMAN: Thank you for your letter of August 13, providing me with the opportunity to comment on the relevance of United States ratification of the Vienna Convention on the Law of Treaties to the validity of the principles of treaty interpretation stated in that convention.

While the United States has not yet ratified the Vienna Convention on the Law of Treaties, we consistently apply those of its terms which constitute a codification of customary international law. Most provisions of the Vienna Convention, including Articles 31 and 32 on matters of treaty interpretation, are declaratory of customary international law. (See the Commentary of the International Law Commission, United Nations Conference on the Law of Treaties, A/Conf. 39/11/Add.2, 1971, p. 38.)

As provided in Articles 31 and 32 of the Vienna Convention, the interpretation of a treaty does not necessarily depend entirely upon its negotiating history, but recourse is had to the negotiating history when other means of interpretation leave the meaning of a provision ambiguous or obscure.

As a matter of judicial and executive practice, negotiating history, like the legislative history of a statute, is frequently relied upon in U.S. domestic law and in international law to interpret treaties.

I am enclosing with this letter my responses to the supplementary questions put to me by the Subcommittee in Ronald Konkel's letter of August 7. In light of the scope of the questions, I very much appreciate the Subcommittee's consideration in putting the deadline over into September.

Sincerely yours,

ROBERTS B. OWEN.

COMMON HERITAGE—INTERPRETATION

Question 1. Is the phrase the "common heritage of mankind" as used in the Moon Treaty in any way related to the use of that phrase in the negotiating text on the Law of the Sea Treaty?

It is often argued by those opposing the Treaty that the meaning of certain words and phrases is set by precedent, earlier debate and analysis and that the agreement must rely on already established meanings. This applies particularly to the phrase "common heritage of mankind" which is believed by the vast majority of nations to mean common property, implying a commonness of ownership and benefit.

Answer. The phrase "common heritage of mankind" finds its meaning only in each particular context in which it is used. Its use in the Moon Treaty is related to the same phrase in the Law of the Sea context in a very general sense; the two negotiations have been largely contemporaneous and, in both, the phrase deals with

depletable resources outside the limits of national sovereignty, to be exploited for the benefit of all. However, the detailed meaning and implications of the phrase "common heritage of mankind", as used in the Moon Treaty, are not legally established or determined by the meaning and implementation of that phrase in the negotiating text of the Law of the Sea Treaty. Article 11, paragraph 1, of the Moon Treaty expressly denies such a relationship, stating that the phrase as applied to the moon and its natural resources "finds its meaning in the provisions of this agreement."

It is clear from the various positions put forward as to the meaning of "common heritage of mankind" during negotiation of the Moon Treaty that it does not have one fixed, well defined, and generally accepted meaning, such as "common property". Even without the specific language of Article 11, paragraph 1, cited above, it would be highly doubtful legally to assert that the elaboration of a common heritage regime in the law of the sea negotiating text must be deemed to control the meaning to be given "common heritage" in an agreement dealing with a radically different environment and context. In any event, the terms of Article 11 itself and the negotiating history of Article 11(1), especially the long-standing Soviet opposition to the term and their insistence that it finds its meaning solely within the Moon Treaty itself, remove any reasonable basis for arguing that the law of the sea regime would be legally controlling. It is crystal clear that the participants in any future conference attempting to negotiate a regime to govern the exploitation of nonterrestrial resources will have the right to define common heritage for moon resources differently than it may be defined in any other context. It is, of course, a familiar legal practice to define a term specifically for the purpose of a specific law or treaty, even a term which, unlike "common heritage of mankind", has a well-established customary meaning.

Question 2. The minerals of the deep seabed, which are beyond national jurisdiction, have been declared to be the "Common Heritage of Mankind." Ambassador M.C.W. Pinto of Sri Lanka, a leading international lawyer on the law of the sea, interpreted this for the law of the sea as follows:

"This (Common Heritage of Mankind) means that those minerals cannot be freely mined. They are not there, so to speak, for the taking. The common heritage of mankind is the common property of mankind. The commonness of the "common heritage" is a commonness of ownership and benefit. The minerals are owned in common by your country and mine, and by all the rest as well. In their original location, these resources belong in undivided and indivisible share, to your country and to mine, and to all the rest—to all mankind, in fact, whether organized as states or not. If you touch the nodules at the bottom of the sea, you touch my property. If you take them away, you take away my property."

It has been said that this interpretation of the phrase "Common Heritage of Mankind" would undoubtedly be supported in its entirety by all of the developing countries in the United Nations of which I understand there are about 120. What is the Department's view?

How can the United States prevent Ambassador Pinto's interpretation of the phrase "Common Heritage of Mankind" from being the accepted definition, particularly since the Conference called to establish the "international regime" will establish its rules of procedure which can be anticipated to be one nation—one vote?

Answer. As pointed out in response to Question 1, the Moon Treaty text and negotiating history demonstrate that Ambassador Pinto's statement is not agreed or legally authoritative as regards the meaning of the common heritage notion in the Moon Treaty. Any negotiation to attempt to establish an international regime for exploitation of nonterrestrial resources is not likely to be held for some 15 to 30 years (when exploitation may be "about to become feasible"). Further, it is most likely that the negotiating dynamics will be different in a moon resources negotiation than in a comprehensive LOS negotiation with its distinct range of interests and issues. In all probability there will be significant differences in the economic, political, and legal contexts of the two potential regimes. Therefore, predictions about the position likely to be taken by those States which will be party to the Treaty and, thus, participants in the negotiations are somewhat problematical. It should also not be assumed that the developing countries would easily abandon the consensus procedures which have prevailed thus far in space law in order to force through, on a one nation one vote basis, a treaty text rejected by the States which have or are about to have significant space resource exploitation capabilities, particularly since there is no exploitation moratorium established by the Moon Treaty and a Moon Treaty party which does not join a future regime would nonetheless be free to exploit nonterrestrial natural resources, albeit without the protection of the agreed regime, subject only to the provisions of Articles 11(7) and 6(2) of the Moon Treaty.

Question 3. How does the term "common heritage of mankind" differ from the term "province of all mankind" used in Article 4?

Answer. These terms are, in fact, closely related. Article I of the 1967 Outer Space Treaty, the predecessor of Article 4 of the Moon Treaty, stated that the "exploration and use of outer space, including the moon and other celestial bodies, . . . shall be the province of all mankind." Narrowly or literally read, "province of all mankind" in this context means that the exploration and use of outer space are the proper concern or business of all mankind. The phrase may, however, be construed more broadly as summing up the fundamental principles of outer space law elaborated in Article I and subsequent articles of the 1967 treaty, for example, that the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries; that outer space shall be free for exploration and use by all States without discrimination, with free access to all areas of celestial bodies; that outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means; and that space exploration and use will be carried out with due respect for the corresponding interests of others.

Within the context of the Moon Treaty, "common heritage of mankind" adds to "province of all mankind" and the basic principles of the 1967 treaty a procedural element through Article 11, paragraph 5, which provides for future negotiations to establish an international regime for the exploitation of the resources of the moon and other celestial bodies. Paragraphs 7 and 8 of Article 11 also add some guiding principles for the international regime.

Question 4. What is the Soviet Union's interpretation of the phrase "common heritage of mankind"?

Answer. Early in the Moon Treaty negotiations, the Soviet Union had taken the position that the "common heritage of mankind" was a philosophical, not a legal concept. In its 1973 working paper, the Soviet Union states that celestial bodies are available for the undivided and common use of all States, but are not jointly owned by them. The statements made by their representatives in 1976 and 1977 indicated that they considered the phrase "common heritage of mankind" to be juridically and politically vague, that its inclusion in a treaty "solves no problems". The Soviet Union in 1976 rejected the notion "that space activities should be internationalized and a supra-State nature should be given to whatever body guides those activities." The Soviet representative said that compromise on this matter should be sought through "very accurate interpretation of the concepts used in the draft treaty, on the basis of due respect for the sovereign rights of States participating in space activities." The compromise which was accepted by the Soviet Uniion in 1979 specifically restricted the meaning of the phrase "common heritage of mankind", as used in Article 11, to the terms of the Moon Treaty itself. The Soviets apparently consider it a political concept devoid of specific legal content and expect the phrase to take on any further content through negotiation.

Question 5. Will the Common Heritage of Mankind principle, as used in the Agreement on the Moon and Other Celestial Bodies, be applicable only to the States party to the Agreement, or will it apply to all States when the Agreement comes into effect?

To what extent is customary international law established for nations regardless of whether or not they have ratified the various space treaties?

Answer. As explained in responmse to Question 3, the "common heritage of mankind" principle is closely related to "the province of all mankind" and the fundamental space law principles set forth in the 1967 Outer Space Treaty, but as used in the Moon Treaty, "common heritage" adds a new element negotiation of an international regime for which certain purposes are agreed. States not party to the Moon Treaty will not be bound by this added element. Nor will they or Moon Treaty parties be bound by the agreement establishing the international regime unless they accede to it.

The extent to which customary international law is established for nations regardless of whether or not they have ratified the various space treaties cannot be answered categorically. It varies depending on the nature of a particular treaty provision and the acceptance which that provision has obtained among States, particularly those carrying out activities in space, and among leading authorities as a statement of customary international law. Regardless of whether or not a State is party to the 1967 Outer Space Treaty, there is little doubt that certain principles laid down in the 1967 Outer Space Treaty, and set forth earlier in the 1963 Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (U.N. General Assembly Resolution 1962 (XVIII)), are now accepted as customary international law, e.g., that outer space and celestial bodies are not subject to national appropriation by claim of sovereignty, by means of use or

occupation or by any other means; and that international law, including the UN Charter, applies to States in their space activities. However, not all aspects of every space treaty produced by the United Nations have been intended to state principles of the same generally binding nature, nor have all come to acquire that quality. Further, a space treaty provision would not readily achieve the quality of customary international law if opposed or explicitly rejected by a State playing a significant role in the exploration and use of outer space.

COPUOS UNDERSTANDINGS

Question 6. Before reaching consensus on the agreement, the Committee on the Peaceful Uses of Outer Space made a decision to clarify certain parts of the agreement by stating certain understandings in its report. There are three understandings to be found in paragraphs 62, 63, and 65 of the Committee's report. It is noted that the resolution adopted by the General Assembly endorsing the treaty called attention to these three paragraphs. What is the legal status of these three understandings?

Answer. Under the suctomary international law of treaty interpretation, as codified in Articles 31 and 32 of the Vienna Convention on the Law of Treaties, the understandings set out in paragraphs 62, 63 and 65 of the 1979 Report of the Committee on Peaceful Uses of Outer Space constitute an authoritative interpretation of the questions they address.

COMMERCIAL USES OF SPACE

Question 7. If the United States signed and ratified the agreement, would this give other nations any control over the timing and direction of U.S. private sector engaging in and expanding the commercial uses of outer space?

Answer. No. The Agreement establishes no legal moratorium on resource exploitation or other commercial uses of outer space and gives no other nation or group of nations control over the timing and direction of United States space programs. The United States would not be obligated to adhere to a future international regime for resource exploitation if it contained unacceptable provisions in this or any other respect; and nonadherence to such a regime would not in any way limit the right of the United States to exploit nonterrestrial natural resources.

AGREEMENT AS ADDITIONAL SPACE LAW

Question 8. It has been argued that many of the provisions of this Agreement are already embodied in other space treaties and that in the few instances where additions are being made to the existing body of space law, that the changes are incremental and have no real or practical importance to the United States. What is the Department of State's response to that view?

Answer. The United States Government assessment of this question was presented by Ambassador Petree to the United Nations General Assembly Special Political Committee on November 1, 1979, in the following terms:

"The draft Moon Treaty is based to a considerable extent on the 1967 Outer Space Treaty. Indeed, the discussion in the Outer Space Committee confirmed the understanding that the Moon Treaty in no way derogates from or limits the provisions of the 1967 Outer Space Treaty.

"Of course, the draft Moon Treaty also is, in its own right, a meaningful advance in the codification of international law dealing with outer space, containing obligations which are of both immediate and long-term application in regard to such matters as the safeguarding of human life on celestial bodies, the promotion of scientific investigation and the exchange of information relative to and derived from activities on celestial bodies, and the enhancement of opportunities and conditions for evaluation, research and exploitation of the natural resources of celestial bodies."

In addition, the Moon Treaty adds provisions of significance for arms control and for protection of the environment of celestial bodies.

As I indicated in my testimony, the Administration is now engaged in an interagency study to examine matters relating to possible signature of the Treaty and its transmittal to the Senate. This consideration of the various political, economic and legal issues will include an assessment of the Treaty's importance to the United States.

Question 9. What provisions of the Celestial Body Agreement go beyond the space treaties already in force? Do they offer positive guidelines for the future development of space industries?

Answer. As the comparison set out in the Galloway study makes clear, there are numerous differences of varying significance between the text of the Moon Treaty

and the provisions of space treaties already in force. The Moon Treaty goes beyond the existing body of space law in a number of ways including:

Expanding the existing obligation of "due regard" for the interests of other States during space activities to a prohibition on interference with the activities of other States in the exploration and use of celestial bodies (Article 8, paragraph 3);

Extending the 1967 Outer Space Treaty's specific permission of the use of any equipment necessary for the peaceful exploration of celestial bodies to cover peaceful use as well (Article 3, paragraph 4);

Adding specificity to the existing freedom of scientific investigation, expressly stating the right to collect, remove and retain control over mineral and other substances found on celestial bodies and the right to use such resources of celestial bodies to support scientific missions (Article 6);

Expanding and adding greater specificity to the notice and reporting requirements established under earlier treaties, e.g., establishing a periodic reporting requirement for long missions (Article 5, paragraph 1) and requiring reports of: indications of organic life (Article 5, paragraph 3), phenomena which could endanger human life and health generally (Article 5, paragraph 3), environmental protection measures being taken, the fact and purpose of all placements of radio-active materials on celestial bodies (Article 7, paragraph 2), areas of special scientific interest on celestial bodies which might be considered for designation as scientific preserves (Article 7, paragraph 3), any natural resources discovered on celestial bodies (Article 11, paragraph 6), emergency use made of another party's facilities or equipment on celestial bodies (Article 12, paragraph 3) and information on unintended landings of space objects on celestial bodies (Article 13);

Expanding the existing obligation to avoid harmful contamination of outer space during study and exploration, so that it covers such contamination during other uses of celestial bodies and requires measures to prevent disruption of the existing balance of the environment of celestial bodies by other means, such as "introducing adverse changes" (Article 7, paragraph 1);

Providing persons on celestial bodies the protections afforded "astronauts" under the 1976 Astronaut Rescue and Return Agreement, requiring the offer of shelter to persons in distress on celestial bodies, and permitting the use of another State's facilities and equipment in an emergency involving a threat to human life (Articles 10 and 12, paragraph 3);

Clarifying the provision for retention of national jurisdiction and control over personnel on celestial bodies, and applying the Return Agreement undertakings to installations and equipment found out of their intended place on celestial bodies (Article 12);

Specifying the freedom to establish manned and unmanned stations on celestial bodies and spelling out the limitations, flowing from established principles, that a station may use only the area required by its needs and shall be installed in a manner not to impede free access to all areas of the celestial body (Article 9);

Clarifying the existing inspection provision requiring that all stations, installations, equipment and space vehicles on celestial bodies be open to representatives of other parties for visits, with advance notice, by linking it to the limited purpose of assuring that the activities are in conformity with the treaty (Article 15, paragraph 1);

Extending the following provisions to trajectories to or orbits around the moon and other celestial bodies: the existing prohibition on placing in earth orbit or stationing in space nuclear or other weapons of mass destruction (Article 3, paragraph 3); the existing prohibition on the establishment of military bases, installations and fortifications, the testing of any type of weapons, and the conduct of military maneuvers on celestial bodies (Article 3, paragraph 4 with Article 1, paragraph 2); and the inspection principle (Article 15, paragraph 1 with Article 1, paragraph 2);

Specifying that the resources of celestial bodies are "the common heritage of manking," tying the meaning of that phrase to the provisions of the Moon Treaty itself (Article 11, paragraph 1), providing for the elaboration of an international regime for resource exploitation in the future (Article 11, paragraph 5), stating the main purposes of that regime (Article 11, paragraph 7), and requiring that all activities with regard to celestial body resources be carried out in a manner compatible with those purposes (Article 11, paragraph 8);

Making clear that the existing obligation to carry out space activities "for the benefit and in the interests of all countries" and to treat such activity as "the province of all mankind" requires, with regard to the benefits derived from celestial body resources, special consideration to "the interests and needs of the developing countries as well as the efforts of those countries which have contributed * * * to the exploration" of celestial bodies (Article 11, paragraph 7d); and

Making clear that, while celestial body subsurfaces and natural resources "in place" could not be made the property of anyone, natural resources which have been removed are not under that principle (Article 11, paragraph 3).

A number of features of the Moon Treaty offer positive guidelines for the development of space industry, for example, the confirmation of the right to establish manned stations; the limitation of the right of inspection to assuring compliance with the agreement; the limitation on the prohibition of acquisition of property rights in natural resources to those "in place" on celestial bodies; the clearer noninterference rule already referred to; the added protections to personnel on celestial bodies; the specific reinforcement of scientific freedom, necessary to the development of space industry; and specifying the main purposes for celestial body resource exploitation, including special consideration to be given the contribution of countries like the United States in determining how the benefits of such resources are to be equitably shared.

On the other hand, there are both benefits and burdens to be found in a number of provisions, such as the environmental protections required, the restrictions on the area to be used by a facility on a celestial body, the requirement of keeping access open to all areas of a celestial body, the information requirements, and the "common heritage" principle with its commitment to negotiate and international regime to govern resource exploitation. The principal concerns regarding space industry development relate to the future "international regime", which has been discussed extensively in other testimony before the committee. The Department of State, along with other agencies, will be re-examining these questions during the interagency study of the Moon Treaty.

Question 10. Would the Agreement affect future space colonies?

Answer. The Agreement would apply to space colonies on the moon or other celestial bodies in the solar system, or in the orbits around them. It would affect them in the sense that such colonies would have to operate within the rules of the Agreement. However, I do not believe that these rules should hinder the United States from establishing and operating space colonies; they should help to ensure that space colonies of other States, like our own, contribute to the peaceful and beneficial use of outer space.

Question 11. Is there any way in which the provisions of the Celestial Body Agreement might hinder the progress of space science and technology?

Answer. NASA is providing the response to this question.

INTERNATIONAL REGIME

Question 12. How can the Senate be clear and definitive on the point that another agreement dealing with an international regime must come before the Senate for separate consideration and that if the Senate should give advice and consent to the ratification of the Celestial Bodies Agreement, this does not permit the Executive Branch at some future time to conclude an executive agreement concerning an international regime?

Answer. The Executive Branch has made clear to the United Nations and the Senate that the agreement establishing an international regime would be submitted to the Senate for its advice and consent to ratification, just as we have sought and obtained advice and consent to United States ratification of the space treaties currently in force. The Senate Foreign Relations Committee could clearly and definitively state its view on the matter in a variety of ways. It might put on the record a statement that advice and consent to the Moon Treaty would not constitute authorization for the Executive Branch to adhere to an agreement concerning an international regime.

EARTH ORBIT

Question 13. Does the Celestial Bodies Agreement make it legally certain that the Agreement does not apply to space activities in earth orbit, other than space activities on the Moon (which is in earth orbit)?

Answer. Article 1(1) specifically excludes the earth from the celestial bodies to which the agreement applies, and, consequently, earth orbits are excluded from Article 2(2) of the agreement, the provision which brings orbits of celestial bodies within the scope of the agreement. This is confirmed by the authoritative interpretation set out in paragraph 63 of the 1979 Report of the Committee on the Peaceful Uses of Outer Space and the statement made to the United Nations General Assembly Special Political Committee by United States Ambassador Petree on November 1, 1979. Accordingly, except for activities on the moon and in orbits and other trajectories to and around the moon, as well as the remotely possible case of a

new celestial body entering earth orbit, it is legally certain that the agreement does not apply to space activities in earth orbit.

Question 14. In the Agreement, the terms "spacecraft", "space object", and "man-made space object" are used. What is the definition of each of these terms and how do the meanings of these terms differ from one another?

Answer. NASA is providing the answer to this question.

PERSONNEL OF SPACECRAFT

Question 15. In the Agreement, the term astronaut is used but not defined. Also the term "personnel of a spacecraft" is used but not defined. Do these two terms mean something different or the same thing?

Answer. These terms overlap in meaning. It appears to be the understanding of some that the term "astronaut" describes those persons specially trained and highly skilled in space flight. Literally, however, "astronaut" applies to all persons who voyage outside the atmosphere of the earth.

Question 16. Does the Agreement on the Rescue and Return of Astronauts apply to both astronauts and personnel of a spacecraft?

Answer. Yes.

Question 17. In a study prepared for the committee by Eilene Galloway, there are a number of issues which she lists as requiring in-depth analysis. Would the State Department please respond in detail in writing to issues 7, 8, 9, 10, 11, 14 and 16?

Issue 7: Are definitions needed, in order to prevent or minimize future disputes, for the following concepts?—

(a). *Common heritage of mankind.*—What does this term add to "the province of all mankind" provided in Article 4 of the Agreement? Can this concept be confined to the Moon Agreement as intended or is it likely to provide a precedent for other subjects such as the law of the sea?

(b). *International regime.*—What models of international institutional arrangements can be analyzed for possible application to the future organization envisaged by the Moon Agreement? What are the options?

(c). *Developing countries.*—If the assumption is correct that it will be many years before exploitation is undertaken on the Moon and other celestial bodies, some countries now referred to as "developing" will have become developed. What provision is made for defining the developing countries in a list and for removing them from the list once they have become developed?

(d). *Equitable sharing.*—Can it be established that such sharing permits portions according to the degree of contribution by different nations? Is it absolutely clear that "equitable sharing" is not the same as "equal sharing" with nations that have not contributed to the effort, even indirectly?

(e). *Benefits derived from exploitation of natural resources.*—What are likely to be some of the benefits to be derived from this effort? Since provision is not for equitable sharing of the natural resources but for the benefits derived therefrom, how will the final point in the production process be determined for obligatory sharing?

(f). *Celestial bodies.*—If asteroids are defined as celestial bodies and they are towed into Earch orbit, will the Moon Agreement apply to their exploitation for minerals? Since the sun is a celestial body, do benefits derived from solar power come under this agreement?

Answer. (a) *Common heritage of mankind.*—Widely differing views as to the specific meaning of "common heritage" or its lack of detailed meaning evidenced during the negotiation led to the compromise of defining it, in the context of the Moon Treaty, by reference only to the terms of the Moon Treaty itself, in particular, the provision for future negotiation of an international regime for resource exploitation. There was widespread agreement that the detailed international regime negotiations should occur only "as such exploitation is about to become feasible."

What the term "common heritage" adds to "the province of all mankind" has been discussed in response to a previous question. Essentially, as used in the Moon Treaty, "common heritage" adds to the fundamental principles of the 1967 Outer Space Treaty the procedural element of good faith negotiation of an international regime whose main purposes are set out in Article 11, paragraph 7.

Since the elaboration of an international regime for space resources is expected to occur long after the conclusion of the law of the sea negotiations, and involves a different environment with some different economic and political forces at play, the former is not likely to provide a precedent for the latter.

(b) *International regime.*—The "international regime" will require definition through a future negotiation. The options will have to be analyzed and evaluated in light of the knowledge of space resources and the experience accumulated in other areas prior to the negotiation. The phrase does not require that a multiateral

institution be established. However, the law of the sea experience, INTELSAT and INMARSAT have been cited as possibly relevant precedents. Other looser arrangements for coordinating and guiding activities in areas of common concern, such as the Antarctica consultative mechanism, might be considered. New forms of institutional arrangements and other examples will most certainly be thought of in the decades before such a negotiation is likely to take place.

(c) *Developing countries.*—No provision is made for establishing or revising a special list of "developing countries" for purposes of the Moon Treaty. Should there be a dispute over the status of a particular country in connection with equitable sharing in the benefits of the use of space resources, it is probable that most countries would refer to the then current list of "developing countries" maintained and revised by the United Nations or one of the international development assistance institutions according to various economic criteria.

(d) *Equitable sharing.*—It is by no means required, as a legal or practical matter, that "equitable sharing" of benefits be accomplished through a process of determining "portions" for various countries or categories of countries. Nevertheless, the terms of Article 11, paragraph 7(a), state that special consideration is to be given to "the efforts of those countries which have contributed directly or indirectly to the exploration of the moon" and other celestial bodies. From this it would appear that, if "portions" are eventually decided upon, different "portions" or shares of benefits would be permitted for different levels of effort. Since special consideration is to be given the efforts of exploring countries and needs of developing countries, it should be clear that "equitable sharing" is not the same as "equal sharing". Further, as with the Outer Space Treaty provision on benefits (Article 1), the United States does not regard the Moon Treaty provision on "equitable sharing" as diminishing in any way the exclusive right of the United States to determine how it shares the benefits derived from the resources exploited by it or its nationals.

(e) *Benefits derived from exploitation of natural resources.*—Equitable sharing of the benefits may flow from the beneficial nature to mankind of the space activity to which the resources are put and the spin-offs for earth applications which may be derived. Given the variety of means of satisfying the provision for "equitable sharing", it is not feasible to predict how a negotiation many years away will treat the matter. If what is agreed were to involve any direct calculation of benefits and literal apportionment of shares, the point in the process for determining shares would be likely to flow from the nature of the benefit itself.

(f) *Celestial bodies/solar power.*—(NASA is providing the answer to this question insofar as it concerns asteroids.)

No. Since the object of the natural resources regime under the Moon Treaty would be to govern exploitation of the depletable natural resources discovered on the moon and other celestial bodies, rather than the energy radiated from the sun and other celestial bodies, solar energy benefits would not be included under the benefit sharing purposes of the Moon Treaty resources regime. Of course space activity related to the exploitation of solar power would, like all other space activity, fall within the ambit of Article I of the 1967 Outer Space Treaty, repeated in essence in the Moon Treaty, that "the use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries * * *." Under foreseeable circumstances, the exploitation of solar energy is likely to have benefits for and be in the interests of the world as a whole, if only by adding to the total energy available for use.

Issue 8: Is there anything in the Moon Agreement which would prevent the development of solar power satellites?

Answer. NASA is providing the response to this question.

Issue 9: Even if the Moon Agreement does not create a legal moratorium on the exploitation of the natural resources of the Moon and other celestial bodies, is it likely to create a period of such uncertainty for private enterprise as to deter investment by industry and/or a combination of industry and government? If so, would a policy such as that in the Deep Seabed Mineral Resources Act be applicable?

Answer. This question has been addressed in detail in the testimony I submitted to the committee on July 29. The question is essence is whether a de facto moratorium based upon perceived uncertainties about the future is more likely to exist if the United States adheres to the Moon Treaty than if we do not. One school of thought is that U.S. refusal to adhere could inhibit widespread acceptance of the Moon Treaty and preserve U.S. options for the development of an international regime under more favorable auspices. Implicit in this point of view is the belief that there would be less uncertainty without the Moon Treaty—and an eventual negotiation of a broad-based international regime thereunder—than with it. The other school argues that wide adherence to the Moon Treaty is to be expected, that U.S. interests

would be served by an acceptable broad-based international regime under its terms, that uncertainty would exists even without the Moon Treaty, and that U.S. participation in this particular process would enchance the prospects of achieving an acceptable regime. As noted in my July 29 testimony, if future circumstances warrant, Congress may in due course wish to consider unilateral enactment of national legislation establishing a legal framework for U.S. companies to engage in nonterrestrial exploitation, for which certain aspects of the Deep Seabed Mineral Resources Act (Pub. L 96–283) may be an appropriate analogy. Nothing in the Moon Treaty prohibits such legislation, for which there would be ample time in the future if investor insecurity were to pose a problem and the government wished to encourage early exploitation of lunar resources by private industry.

Issue 10: Are the advances over the other space treaties in the arms control provisions reason enough to accept the Moon Agreement?

Answer. The arms control provisions of the Moon Agreement are of significance to the United States and they are part of the interagency study of the Moon Treaty currently underway. Since that study is not complete, I cannot provide a definitive response as to whether these provisions or other provisions are a sufficient basis for acceptance of the Treaty.

Issue 11: Is there an overemphasis on natural resources and their exploitation as compared to other ways in which the Moon and other celestial bodies might be used?

Answer. It is clear from the discussion generated by the agreement that the main area of controversy relates to the treatment of natural resources and their exploitation. However, the Treaty also deals extensively with exploration and use of the moon and other celestial bodies generally, and has a number of provisions specifically dealing with scientific activities and matters of scientific interest.

Issue 14: What can be done about the uneven membership of States in the total body of space law that has been developed? For example, of the 47 nations represented on the UN Committee on the Peaceful Uses of Outer Space, only 14 have thus far become parties to all four space treaties now in force. There are 76 members of the 1967 Treaty; 71 of the 1968 Astronaut Agreement; 58 of the Liability Convention; 26 of the Registration Convention; plus the Ukrainian S.S.R. and the Byelorussian S.S.R. for all four treaties.

Answer. It is not clear that the uneven participation of States in the various space treaties constitutes a problem, since the participation of the principal space powers and such a large number of other States in the basic agreements constitutes a fairly solid legal foundation of which space activities can proceed and the body of space law and practice can continue to develop.

It is the policy of the United States to encourage as wide as possible adherence to these treaties. Clearly, many States will adhere only if they perceive some benefits accuring to them.

Issue 16: A response to this question is included above, in response to Question 5.

Questions 18, 19, and 20. NASA is providing the response to questions 18 (Article 12), 19 (environment), and 20 (reporting and informing).

Senator STEVENSON. Our next witness is Dr. Art Morrissey, Senior Policy Analyst, Office of Science and Technology Policy.

STATEMENT OF DR. ART MORRISSEY, SENIOR POLICY ANALYST, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, EXECUTIVE OFFICE OF THE PRESIDENT

Dr. MORRISSEY. Mr. Chairman, I am pleased to appear before the Subcommittee on Science, Technology and Space. This is the Office of Science and Technology Policy's first opportunity to review with you the "Agreement Governing the Activities of the States on the Moon and Other Celestial Bodies" or more briefly the Moon Treaty. Considerations raised by this committee and others are being examined by the administration. We are assessing how the treaty provisions would affect the space environment, including the concern that you have raised over the exploration of extraterrestrial resources. Moreover, in your letter of invitation you asked that we respond to how the administration's position will evolve and to what extent the private sector will be consulted. As you know, the ongoing interdepartmental review is still in progress. On

completion of this examination, we will know whether additional considerations need to be taken into account. Through this process, we can best present to you any associated implications when the treaty is subsequently submitted to the Senate for ratification.

BACKGROUND

The Outer Space Treaty of 1967 is generally accepted as the basic charter or constitution governing space activities. This treaty includes articles establishing that the exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development and that outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination and there shall be free access to all areas of celestial bodies.

This treaty also states that outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claims of sovereignty, by means of use or occupation, or by any other means. In the exploration and use of outer space, parties to the 1967 treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of other parties to the treaty.

Other articles in the Outer Space Treaty of 1967 provide that:

The placing in orbit around the Earth, stationary in outer space, or the placement on celestial bodies of any objects carrying nuclear weapons or any other kinds of weapons of mass destruction is proscribed.

The Moon and other celestial bodies shall be used exclusively for peaceful purposes.

Parties to the treaty bear international responsibility for national activities including activities of nongovernmental entities in outer space, including the Moon and other celestial bodies.

Three subsequent treaties that followed elaborated on these basic principles. These treaties are: The 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space; The 1972 Convention on International Liability for Damage Caused by Space Objects; and The 1974 Convention on Registration of Objects Launched into Outer Space.

During its 1979 session, the U.N. Committee on Peaceful Uses of Outer Space reached consensus on a fifth treaty, the Agreement Governing Activities of States on the Moon and Other Celestial Bodies. The Moon Treaty, like its three predecessors, is an elaboration of basic principles first established in the 1967 Outer Space Treaty. The treaty was opened for signature by the U.N. General Assembly on December 5, 1979.

THE TREATY

After some 7 years of effort, the U.N. Committee on Peaceful Uses of Outer Space, commonly known as the Outer Space Committee, completed its fifth treaty text. It is the reaffirmation of the constructive spirit of the committee and highlights the validity of the consensus procedures by which the Outer Space Committee

operates. While consensus is not the speediest process, it insures that the results of the Outer Space Committee are constructive.

The Moon Treaty is based to a considerable extent on the 1967 Outer Space Treaty. Indeed, the discussion in the Outer Space Committee confirmed the understanding that the Moon Treaty in no way limits the provisions of the 1967 Outer Space Treaty. The Moon Treaty recognizes that the Moon, as a natural satellite of the Earth, is important in the exploration of outer space, but at the same time intends to promote, on the basis of equality, the further development of cooperation among States in the exploration and use of the Moon and other celestial bodies. Moreover, it is designed to prevent the Moon from becoming an area of international conflict.

The Moon Treaty is intended to be an advance in international law dealing with outer space, containing obligations which are of both immediate and long-term. Matters are addressed such as the safeguarding of human life on celestial bodies, the promotion of scientific investigation and the exchange of information relative to and derived from activities on celestial bodies, and the enhancement of opportunities and conditions for evaluation, research and exploitation of the natural resources of celestial bodies. Perhaps, it would be useful for me to discuss here today some of the more significant provisions contained in the Moon Treaty.

In article 1 of the treaty, references to the Moon are intended also to be references to other celestial bodies within our solar system. Second, references to the moon's natural resources are intended to comprehend those natural resources to be found on other celestial bodies. Third, the trajectories and orbits referred to in article 1 do not include trajectories and orbits of space objects between the Earth and Earth orbit or in Earth orbit only. That fact that a space object in Earth orbit also is in orbit around the Sun does not bring space objects, which are only in Earth orbit, within the scope of this treaty.

In regard to articles 2 and 3 of the treaty, article 2 reaffirms the application of the charter of the United Nations and of international law to outer space. While the charter predates man's entry into space, its principles and provisions, including those relating to the permissible and impermissible uses of force, are as valid for outer space as they are for our seas, land or air. We welcome the reaffirmation in the Moon Treaty of this essential point.

Article 3 contains a statement of the principle that the celestial bodies, and those orbits around them and to them, are only to be utilized for peaceful purposes. It reiterates the prohibitions in article 4 of the 1967 Outer Space Treaty against the orbiting or placement of nuclear or other weapons of mass destruction. In elaboration of the 1967 provisions, article 3 explicitly prohibits the threat or use of force or hostile act on the Moon and the use of the Moon for such acts or threats in relation to the Earth, the Moon, spacecraft or personnel.

Article 4 reiterates and emphasizes the principle of international cooperation in the exploration and use of the Moon, and states that due regard should be paid to the interests of present and future generations and to the need to promote higher economic and social standards.

66-705 O - 80 - 3

Article 5 constitutes a significant advance over the Outer Space Treaty in regard to the provision of information to the public relating to missions to celestial bodies.

Article 6 is concerned with freedom of scientific investigation. In addition to reiterating the basic principle of such freedom without discrimination of any kind, this article specifically confirms for the first time in a treaty the right of states to collect, remove, maintain at their disposal, and use samples of minerals or other substances from the Moon, and to use such substances for the support of missions on celestial bodies.

Article 7 contains important protection for the environment of celestial bodies. The language of this article is not intended to be read in such a way as would result in prohibiting the exploitation of natural resources to be found on celestial bodies but, rather, that any such exploitation is to be carried out in such a manner as to minimize—insofar as possible—disruption or adverse changes in the environment.

Article 11 states, among other things, that the Moon and its natural resources are the common heritage of mankind and that the governments which become parties to the agreement will undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon. This article—does not on its face—preclude or limit the right or freedom of a particular nation or its nationals to exploit the natural resources of the Moon. Nevertheless, there are some features of the treaty which have given rise to a contention that the treaty will have the undesirable effect of discouraging American industry from undertaking the long-term planning and investment necessary to engage in exploitation of the natural resources of celestial bodies. Those who support this view emphasize that the Moon Treaty uses language similar to that associated with negotiations on the Law of the Sea Treaty.

On the other hand, the opposing point of view is that the Moon Treaty will encourage exploratory and exploitive efforts by American companies through certain of its provisions. There are two provisions often mentioned: First, the prohibition against a party interfering with the activities of another party on a celestial body. Second, the provision to the effect that, although there is no right to own natural resources which are still in place on a celestial body, ownership can be asserted once such resources are no longer in place.

Mr. Roberts Owen, who has testified for the Department of State, has developed fully for your consideration the rationale and aspects of the treaty relating to the matter of exploitation of nonterrestrial natural resources and the Administration's views on the "common heritage of mankind" concept. I don't think it is necessary for me to comment further on this point.

Of the remaining articles it is my intention to mention only Article 18. This article provides for review of the treaty 10 years after entry into force. By request of one-third of the state parties to the agreement, with the concurrence of the majority of the state parties, a review can be requested at any time after the treaty has been in force for 5 years.

PROCESS

In your letter of invitation you asked how the administration intends to proceed. Mr. Neil Hosenball will develop for your consideration the negotiating history of the treaty. I need not address this further. The next step in the process is now underway. Early this year the Department of State established an interagency review group to explore whether further analysis was necessary to undertake prior to submitting the Moon Treaty to the Senate for advice and consent. This interagency review is still going forward. The process should clearly benefit taking into account these hearings.

Since the review is not complete, we do not have a definitive administration position. Care needs to be taken not to harm, in any way, our national economic and security interests; any treaty needs to enhance these goals. Accordingly, the administration is taking a careful and considerate analysis of any concerns raised by the treaty. As part of this process, we have solicited industry views. Over 25 relevant U.S. corporate identities that would have been influenced, or would have a view on the treaty, have been contacted.

A further step, if necessary, would be to refer the Moon Treaty to the Policy Review Committee—Space. As you know, this is the forum that the President established for Federal agencies to advise on proposed changes to national space policy and to provide for rapid referral to him for decision. It was in the Policy Review Committee—Space—that led to the resolution of such issues as civil operational satellite land remote sensing.

In sum, the careful analysis of the Moon Treaty continues. These hearings will be of benefit. The resulting submission to the Senate will be better as a result.

Thank you.

Senator STEVENSON. Thank you.

When will the work of the interagency task force be completed?

Dr. MORRISSEY. At the present time, a timetable has not been established. We are working to make sure the considerations or implications of the treaty are well assessed. No deadline has been set for the completion of this review.

Senator STEVENSON. Do you have a guess?

Dr. MORRISSEY. At this time, the interagency group has been working for several months. I would imagine over the next month or so we will have further resolution.

Senator STEVENSON. Next month or so?

Dr. MORRISSEY. Yes.

Senator STEVENSON. Who chairs this task force?

Dr. MORRISSEY. Department of State.

Senator SCHMITT. Department of State?

Dr. MORRISSEY. Yes. State chairs the interagency task force presently reviewing the implications of the Moon Treaty.

Senator STEVENSON. We would like a copy of the report when it's available. Would you make sure we do?

Dr. MORRISSEY. We will work toward this end. There may be a specific aspect of the final report, that may not be releasable—I will look into that.

Senator SCHMITT. What does that mean?

Will we get the report or not?

I don't understand your last statement. It sounded like you were saying nothing. That you weren't committing to giving this committee access to that report.

Dr. MORRISSEY. In regard to making a commitment, I don't feel I can do that. We will attempt to make all relevant aspects of the report available to you.

Senator STEVENSON. You say that 25 corporations have been contacted for their views on the agreement. What are their views, their prevailing view?

Dr. MORRISSEY. I would say the prevailing view is mixed. Some argue that with a declaration which makes clear that nothing in the treaty could be interpreted as interfering with the right of American companies to exploit the natural resources of the Moon that they support for the treaty. They indicate it would be a positive step in international law.

There are those who have voiced some reservation about the usefulness of the treaty. Others have indicated that their plans for such natural resource exploitation are not far enough along to be able to comment on the utility of the treaty.

Senator STEVENSON. The United States has no program or plans to exploit resources of the Moon or other celestial bodies. We don't know of any other country that has such a program or plans. Why do we need this treaty?

Dr. MORRISSEY. This treaty was negotiated in good faith to establish a better framework for the gradual and intelligent exploitation of the Moon and celestial bodies. That framework would be in existence at a time when technological capabilities were available for extraterrestrial exploration and exploitation of natural resources.

Second, it provides measures for safeguarding human life. It promotes scientific cooperation and expands assurances of exclusively peaceful activities.

Senator SCHMITT. Would the Chairman yield? How can we properly negotiate and then examine and ratify a treaty of this kind when we have no space policy with respect to exploitation of either inner space or outer space?

Dr. MORRISSEY. In regard to a specific policy or programmatic considerations?

Senator SCHMITT. We have no policy. There was no statement we will exploit weightlessness and vacuum for commercial or noncommercial purposes. No policy statement that we will move toward, in some kind of realistic way, the further exploration of the Moon and of other planets and potential exploitation of the resources of the same. We have no such policy. If we do, I haven't heard about it.

Our policy is that we don't do that, in fact. It has been a Presidential statement.

Dr. MORRISSEY. The President's policy in regard to a high engineering, high visibility effort stated that at this particular time it was premature to initiate such an effort but in the meantime, we would take the evolutionary steps to develop the necessary technological capabilities so that we will have that option to proceed at the appropriate time.

Senator SCHMITT. That is doubletalk. We are in a technological position to proceed. Nobody knowledgeable about this area doesn't believe that. Just because you can't do it tomorrow doesn't mean you are not in a technological position to proceed.

We have no space policy. We have negative space policy if we have anything about the commercialization or general use of the resources of inner space, and we have no space policy with respect to the exploration and exploitation of the planets.

My question is: Without such policy, however you want to—you may not want to agree with that statement, but we have no programs or movement in that direction whatsoever—how can we negotiate a treaty? How can we ratify a treaty that presumably will set limits on things that we haven't even decided what they will be and what we want to do?

Dr. MORRISSEY. The step by step evolutionary process, I think, is the appropriate policy direction at this time.

Senator SCHMITT. Why does the treaty come first? Don't you have to develop some at least general perspective on what you want to do in space before we come to the point of negotiating a treaty which presumably will tie our hands?

Dr. MORRISSEY. Your presumption is that it would tie our hands. In previous testimony Mr. Owen talked about how specifically the language was negotiated so as not to tie our hands.

Senator SCHMITT. Basically, it's a piece of paper. There are no limitations placed upon this country if we ratify the treaty?

Dr. MORRISSEY. There are limitations and also opportunities. For example, in the further sharing of information in the scientific exploitation of the Moon.

Senator SCHMITT. So far we have been largely on the giving end and not very much on the receiving end of sharing information.

Dr. MORRISSEY. One of the tenets of this treaty enhances that specific reporting obligation.

Senator SCHMITT. They don't have an awful lot to tell us. Scientific interchange has been good. We learned something. In terms of sheer volume and quantity and quality of information, it has been mainly the United States sharing their technological and scientific information with the rest of the world.

I don't have any problem with that. We are a free country. It's available anyway. We haven't come out very far ahead on these exchanges. Putting them into treaty form doesn't seem to offer very much to us.

Dr. MORRISSEY. It's an attempt to get further information through the treaty. It could be viewed and has been viewed, by some in the scientific community as a positive step forward in the exchange of scientific information.

Senator SCHMITT. Have you put together a balance sheet on what the positive steps are versus the negative steps and restrictions on our future options?

Dr. MORRISSEY. This analysis and review of implications is presently underway.

Senator SCHMITT. You said earlier that you were going to have to do analysis and review with respect to potential changes in space policy.

Dr. MORRISSEY. The review is with regard to this particular treaty.

Senator SCHMITT. There is no space policy that relates to this treaty. There is none. What is the framework for this analysis? That is what I don't understand. I am not necessarily opposed to the treaty. I would like to know where the administration is coming from on this and what kind of recommendations we might expect to have here so we can better prepare to receive them.

Dr. MORRISSEY. That is what we are working toward providing.

Senator SCHMITT. But you are going to provide it in the absence of a space policy; is that right?

Dr. MORRISSEY. Your presumption is that there is an absence.

Senator SCHMITT. Would you tell me your space policy? What is the administration's space policy relative to those things treated by this treaty? Maybe I misphrased the question.

Dr. MORRISSEY. With respect to this Moon treaty. Let me go back at what I indicated earlier, we will take the necessary evolutionary steps to be in a position to carry out exploration and exploitation of the moon or other celestial bodies at a time when we can better decide to do so. This technological capability can then be brought to bear.

Senator SCHMITT. Your space policy is to see if a treaty can be ratified.

Dr. MORRISSEY. The treaty itself will be analyzed within this framework.

Senator SCHMITT. Well, Mr. Chairman, technology development and space policy are two separate things. Usually you develop your policy and then decide what technology is necessary to implement that. Unfortunately, since the days of President Nixon, we have been developing technology without a space policy. It seemed for awhile that we would have a policy to work toward the creation of a permanent space station. A space shuttle was to be part of that. All that is left is the space shuttle without anything else.

It doesn't require any comment unless you want to make it. I fail to understand how anyone in their right mind can accuse this administration of having a space policy.

You mentioned earlier—excuse me, Mr. Chairman. Did you yield to me?

Senator STEVENSON. Yes, it's all right.

Senator SCHMITT. You mentioned that the treaty would prohibit conflict or would attempt to prohibit conflict in outer space. Does that mean it would prohibit competition?

Dr. MORRISSEY. The treaty per se is designed to prevent military conflict. In a sense it is an extension of the outer space treaty denying nuclear weapons in space or weapons of mass destruction and to carry out military maneuvers. Activities of that vein. Competition in the sense of exploration and national resource exploration hardly is viewed in a military conflict.

Senator SCHMITT. But it's military conflict you refer to. Not necessarily conflict between competing commercial interests or national entities for natural resources barring military confrontation.

Dr. MORRISSEY. Looking at it from that direction I am sure there will be commercial competition at some very distant time in the future.

Senator SCHMITT. How does the administration view the presence of hardware in space at the present time which would have to be considered there for military defense purposes on our part and God only knows what purposes on the part of the Soviet Union? Will we just ignore those? The fact that the treaty even before ratified is violated? Or is the administration's position that those don't count?

Dr. MORRISSEY. The 1967 treaty provides for the peaceful uses of outer space. I prefer not to go too much further in open session but there are no satellites perceived as being military or weapons of mass destruction presently in space.

Senator SCHMITT. I am talking about reconnaissance satellites. The discussion of other types of activities in space, some of which is not classified and some is. All I am asking is: Is it generally perceived we are doing nothing now that would be in conflict with the provisions of this treaty?

Dr. MORRISSEY. It would be fair to say yes. Also the treaty itself does not include satellites in near Earth orbit, as mentioned in my testimony.

Senator SCHMITT. Why should the United States give up technological advantages in the use of space resources, assuming we still have some?

Dr. MORRISSEY. I don't know how to respond to the question.

Senator SCHMITT. The Law of the Sea negotiations clearly have retarded the pace at which we exploited technologies developed by this country for the harvesting of the resources of the ocean floor. Are we, with this treaty, going to similarly retard development of U.S. technology or application of that technology to the harvesting, if you will, of the resources of weightlessness, high vacuum and high pumping rates, the view of the Earth from space with unique advantages or even of the titanium and other resources of the Moon?

Dr. MORRISSEY. No, I don't think the treaty intended or was designed not to lead to such erosion that you have articulated. Just the opposite, is true technological opportunities are provided for in the treaty for both exploration and exploitation of the Moon.

Senator SCHMITT. But some of the political provisions, aren't they such that we would run into the same problem we ran into looking at the resources of the deep sea?

Dr. MORRISSEY. I think care is being taken to guarantee that such provisions as you describe are not incorporated, that would prevent such technological erosion.

Senator SCHMITT. Wouldn't you say that it is true that there has been a retardation of our exploitation of deep sea resources, as a consequence of the Law of the Sea negotiations?

Dr. MORRISSEY. I am not competent to comment on that.

Senator SCHMITT. OK. Would you provide some discussion of that for the record?

Dr. MORRISSEY. Yes.

Senator SCHMITT. What is your opinion or your office's opinion about the desirability of understandings and/or reservations to the Moon Treaty to take into account some of the concerns that have been expressed or may be expressed, developed by this committee and others?

Dr. MORRISSEY. I am sorry, I didn't hear the middle part of the question. There was noise from the hall.

Senator SCHMITT. What, in your opinion would be desirable understandings or reservations to the Moon Treaty, taking into account the questions that have been raised and might be raised by your studies or by the studies of the Congress?

Dr. MORRISSEY. I think a declaration perhaps may be tendered at the same time it is submitted for ratification that explicitly states that the common heritage language would not be a limiting aspect for American industry. This would be one possible consideration that might be offered as a reservation. We are presently looking at this possibility.

Senator SCHMITT. Are you doing an analysis of the illegal effect of such understandings and/or reservations, should they be offered?

Dr. MORRISSEY. This is part of the ongoing analysis.

Senator SCHMITT. Would that be included in the report to the committee, if you make a report to the committee?

Dr. MORRISSEY. Yes.

Senator SCHMITT. It is not the administration's opinion that the existence of the Moon Treaty and the provisions within it represents a disincentive to private industry to invest in the technology necessary to utilize nearer space or outer space resources?

Dr. MORRISSEY. That is presently what we are specifically looking at to make sure that the treaty is not a disincentive. A better opinion on whether it is or is not will be addressed.

Senator SCHMITT. Finally, is it felt by the administration, if it is, that it is necessary to have a Moon Treaty, in the view of all the other body of international law that is applicable to these kind of activities?

Dr. MORRISSEY. Some extensions are included in the Moon Treaty, which I mentioned in the testimony. These provisions carry international law one step further. For example, in the further sharing of information or scientific data. That is a positive aspect and an international legal responsibility. That is viewed as an extension of the existing 1967 treaty.

Senator SCHMITT. Thank you, Mr. Chairman.

Senator STEVENSON. Thank you, Dr. Morrissey.

Senator STEVENSON. Our next witness is Dr. Robert Frosch, Administrator of NASA.

I would invite you to summarize, Dr. Frosch—oh, I am told you already have. You reduced this to three pages. Go ahead.

STATEMENT OF DR. ROBERT A. FROSCH, ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Dr. FROSCH. I guess it would be five pages, double spaced. Perhaps I can summarize it at the end of my statement in three sentences.

Senator SCHMITT. Don't violate Schmitt's Law 49: Summaries take twice as long as the prepared text.

Dr. FROSCH. I am afraid I am known for that.

Senator SCHMITT. And everybody else.

Dr. FROSCH. Mr. Chairman and members of the subcommittee, thank you for this opportunity to appear before you in connection

with the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies." As you are aware, no decision has been made as to whether the United States will sign the treaty. Other witnesses here today will discuss the status of executive branch consideration of the proposed treaty.

Your letter of invitation requested that I discuss the exploitation of extraterrestrial resources with respect to technology, cost, schedule and the celestial bodies which might be exploited. Utilization of the materials and energy resources of our solar system for both future space missions as well as terrestrial needs is a prospect which we are just beginning to assess. It is clear that all the raw materials currently used on Earth are available in abundant quantities in space, although distributed in a complex way among other large planetary bodies, moons, asteroids, and comets. It is also clear that the amount of our sun's energy subtended by the planet Earth is indeed a very small fraction of the total available. It will be a challenge for future generations to tap and harness these resources for their needs. At present, we know that any exploitation of extraterrestrial resources will require the development of major new technologies.

Our knowledge of the distribution of usable resources in our solar system is based to a large extent on the limited information available to us from the Apollo program and various planetary missions such as Viking and Voyager. Also we are acquiring a wealth of spectral absorption data with the usual limitations on sensitivity and resolution. Most recently, meteorite finds in the Antarctic have provided a new source of detailed information on the composition of matter in our solar system. Further planetary exploration will be required in order to fill the gaps in our knowledge of the nature and distribution of extraterrestrial materials. However, current interest is focused on three prospects for space materials' utilization.

First of interest is the availability of silicon, aluminum, and iron, among other elements, on the lunar surface. Recent studies have indicated that these materials could be a primary source for the construction of large space structures such as the Solar Power Satellite. Second, we know that certain classes of asteroids contain a wealth of materials such as carbon, iron, nickel, cobalt, and chromium and precious metals such as platinum, osmium, rhodium, rhenium, and iridium. Some of these asteroids may even be Earth-crossing although we have only a limited knowledge of their composition and can see only sizes larger than one kilometer in diameter. Third, we have been studying the availability of planetary chemicals, such as those on Mars, for use in chemical propulsion systems. These would enable return of missions to Earth with large savings in weight for the transport of the necessary propulsion materials from Earth. Of interest also is the availability of water and hydrogen in frozen forms in the outer reaches of our solar system.

Recently, NASA began a more detailed examination of the factors required to acquire and convert space materials and energy into useful forms in a cost-effective manner. A Space Materials System to accomplish this goal is being organized and will possess elements from a number of current NASA programs. A machine

technology, which would exhibit a substantial degree of autonomy as well as some remote construction and operations through telepresence—remotely controlled machine capabilities—methods, would be required. Such a machine system must be capable of not only a high measure of self-sufficiency but also be capable of expansion through ability to replicate many of its own components using the materials and energy available in situ. Furthermore, the processes by which materials and energy are converted to appropriate and useful forms must be adaptive to the space environment conditions of low gravity, high vacuum, and abundant solar energy. All these features of a Space Materials System could be defined through our existing programs in materials processing in space, information processing, machine intelligence, and robotics, energy and propulsion, and materials and structures.

It appears that a number of evolutionary stages of technology development would be required to accomplish a demonstration of a Space Materials System. In the first stage, which would require about 7 years, separate development of materials processing and machine systems technologies appears necessary together with an ongoing program in planetary exploration. In the second stage, a confluence of these technologies would be necessary to accomplish the functional requirements of an operational Space Materials System. Such a demonstration which would undoubtedly be in near Earth orbit would require approximately another 7-year period.

Lastly, a space systems demonstration to a remote planetary body, based on these technologies, would be necessary.

The costs of undertaking a program to develop technologies for using space materials resources have not been fully estimated at this time, but will be the subject of study as various alternatives are examined. These alternatives could cover a substantial range including activities such as propellant acquisition, large space structure and spacecraft construction, and asteroid retrieval to Earth. Cost estimates will be clearly affected by system factors such as degree of autonomy, man/machine interfaces, distribution of intelligence, trade-offs between information, telepresence, and transportation, actual manned presence, and readiness of demonstrated technologies for processing materials, machine intelligence, and robotics.

Extraterrestrial materials and space energy are clearly potential resources for future exploitation by the inhabitants of Earth. NASA has the responsibility to create and develop the space technologies and plan the possible missions needed to make effective use of these resources. When the schedules and scope of the necessary technological advances are better understood, we will have some basis for a rational perspective as to what the world should and would do, in practical terms, about the issues of investment and returns in extraterrestrial resources.

Mr. Chairman, this concludes my prepared statement. I will be happy to respond to any questions that you or the other members may have.

Thank you.

Senator STEVENSON. Thank you.

Dr. FROSCH. Perhaps I should summarize in the promised three sentences by saying it seems clear to us there is no shortage of

either energy or useful materials in the solar system. The problem is the economics of getting access to them, by which I mean making a finite investment whose return in the use of materials and energy will be much larger than that investment. There quite clearly appear to be technological directions involving a good deal of machine robotic systemization and replication which would make the use of such materials economic in the sense that I just described. We are embarking on the planning stages of a program to pull together these technologies in a way that could produce such a result; but it will take quite a lot of time.

Senator STEVENSON. Thank you, Dr. Frosch.

One of the last statements in your prepared statement seemed to imply agreement with Senator Schmitt's earlier comments about the need for space policy. You said, "When the schedules and scope of the necessary technological advances are better understood, we will have some basis for a rational perspective as to what the world should or would do in practical terms about the issues of investment and returns in extraterrestrial resources."

How would this treaty, if approved and it became law, affect all of the plans and activities which you have described?

Dr. FROSCH. It is not clear to me that it would affect the program that we are talking about or have begun to embark on one way or the other. I think it might, however, have some psychological effect on the willingness to invest. My understanding of what the treaty means is that the one thing the treaty would prevent us from doing now, which we probably do not want to do now and may never want to do anyway, would be to lay claim to a specific area or a specific body for future exploitation.

My understanding of it is that if we wanted to actually take material and use it, that the treaty would not bar us from doing that but it would bar us from saying that we laid claim to a particular area while we were not taking material and using it. That might be a sufficient deterrent so that people who would otherwise invest would not do so. I am not sure whether that is the case or not.

Senator STEVENSON. I do not know if you were here at the time Senator Schmitt argued that to consider this treaty we ought to have a space policy. Only then could we consider how it impacted the space policy.

Do you agree with that? Would this treaty help to create the environment and the framework within which nations could, with more confidence, establish space policies, including plans for the exploitation of resources in space?

Dr. FROSCH. I may be tone deaf on this subject, but it is not clear to me that the treaty would affect that very much either way. In that sense, I know of nothing in the current legislation with regard to outer space that would prevent us or anybody else from planning to exploit extraterrestrial materials, provided we proposed to do it in a way which was peaceful, et cetera, and therefore in consonance with existing treaties. I know of nothing in the existing treaties or law that would prevent this or that would particularly encourage us. It is not clear to me this treaty would do either unless investors were to feel that they needed the ability to make a future claim in order to protect their rights of exploitation or,

indeed, unless they were so concerned about the future negotiation of a regime that they would be concerned about that.

However, the treaty seems only to give the signers an obligation to discuss a future regime. Not an obligation to agree on anything which is against their own interests or to enter into such a treaty. So, it is not clear to me that it does very much one way or the other. I am not sure it accomplishes a great deal if it is signed at this point, but I do not see that it prevents very much either.

Senator STEVENSON. Do you have a position on the treaty? For or against?

Dr. FROSCH. I have only a kind of personal view, which I guess I have expressed. At this point, it does not seem to me to do much for or against. It is not quite clear to me personally that it advances the subject very much. I am not, as a personal matter, very partial to inventing legalizations in which no one has any experience. That seems to me to be an interesting theoretical exercise, but it is likely that when one arrives at the situation it is a different situation than was invented beforehand, and may or may not be applicable.

So, I guess I would describe my personal view in the matter as massive indifference.

I am considerably more concerned with the question of whether we go ahead to develop the technological capabilities and the knowledge to do some exploitation, and if that develops in such a way that we need a new kind of legal regime. Then, it would be useful to negotiate such a thing at a time when there is some knowledge to base it on. I recognize there is a school of thought that opposes my view and says the only time you can negotiate a sensible treaty is when nobody has yet developed a personal interest in it. That is the point at which people can be either neutral enough or, if you like, indifferent enough so they will make the necessary compromises to get a treaty. As soon as somebody has an advantage or a particular interest, then it gets very hard to negotiate treaty law. So you ought to get at it before that happens. My problem is that we seem to be getting at it before anybody understands what they are talking about. That may be all right, I do not know.

Senator SCHMITT. The other side of the coin is if you do not have an advantage, it is difficult to get a treaty that you like.

Dr. FROSCH. You do not know whether you are negotiating away your interests or not because you do not know what they are.

Senator STEVENSON. What is NASA's role in this interagency review? Is it one of massive indifference?

Dr. FROSCH. We will participate in the discussion and may become terribly interested depending on how the discussion goes. Certainly we have a responsibility to provide the technological backup on what is likely to be possible.

Senator STEVENSON. Hasn't this discussion been going for almost a year already?

Dr. FROSCH. There has been some discussion for about a year. It was handled essentially on the basis of a legal discussion of the background. I have not been involved.

Senator STEVENSON. Senator Schmitt.

Senator SCHMITT. Is the discussion, Dr. Frosch, of a space materials system a precursor in NASA to a recommendation this be part of a long-term space policy?

Dr. FROSCH. I have some semantic problems with the word "policy." I would say that this is not a question of policy but a question of program. But I am not sure it matters. I am promising to build this into the NASA program if it continues to look as sensible as it appears to at this time.

Senator SCHMITT. If the administration agrees with that, it becomes de facto policy; is that correct?

Dr. FROSCH. I would say it then becomes program. If somebody puts money on it, a budget, it then becomes program.

Senator SCHMITT. Don't programs implement policy?

Dr. FROSCH. Yes, but policy for me is a very general kind of thing which says the policy level is the level that says, "yes, we will have a space program," and "yes, we will maintain leadership," and "yes, we will explore the solar system." That is the level at which I think of as policy. As soon as we say in 3 years we will send a mission which will do thus and so, as far as I am concerned, that is a program and not policy anymore.

Senator SCHMITT. So you consider the statement by John Kennedy, we would go to the Moon by the end of the decade, program, not policy?

Dr. FROSCH. I consider that a programmatic statement. If he started out, the part of the statement that said, "We will have a space program," that is policy. When he said what the program is, that is program. As I say, it is a semantic point.

Senator SCHMITT. It is more significant than that. If you say we will have a space program and do nothing or little or retrench, you are not implementing that policy.

Dr. FROSCH. Precisely.

Senator SCHMITT. That has been the case over the last many years, unfortunately. We said we would have a space program and for many parts of that, including the one you listed, we have been going backwards in terms of investment and level of activity. Not forward. We still have a space policy, because we are still doing something, but the question is what the trends are. That is what concerns me about a Moon Treaty in the absence of what I consider a space policy. Clearly, we have semantic differences.

You say since we have a space policy, which is that we will be in space or do things in space, we can negotiate a Moon Treaty. I would think that a space policy should be a little more specific than that, so we could decide whether a treaty of this kind, possibly with the appropriate reservations or understandings, could move us forward in the implementation of that policy. I sense now there is a bit of a vacuum on that. How does the Moon Treaty assist us or hurt us in the implementation of whatever space policy by my definition we may decide to have in the future? Is it your understanding of this treaty that there would be anything to prohibit, if it were in force 30 years from now, a permanent settlement on Mars?

Dr. FROSCH. As I understand it, there is nothing in here that would prevent that.

Senator SCHMITT. If it was specifically a settlement financed and condoned as part of U.S. national policy?

Dr. FROSCH. I do not think there would be anything in the treaty that would prevent that.

Senator SCHMITT. So long as we did not lay claim to the land underneath that settlement?

Dr. FROSCH. Yes.

Senator SCHMITT. Doesn't that sound ridiculous?

Dr. FROSCH. As long as we were prepared to negotiate in good faith toward a global regime governing such matters—that is my understanding of what the treaty says.

Senator SCHMITT. Operating a settlement placed on Mars as part of a U.S. national policy.

Dr. FROSCH. Governing the overall policy, the overall view of how such settlements fit—that is my understanding of what the treaty says. I think it also makes clear that the question of claim or ownership of the property would not bear on the question of whether somebody else could interfere with it. They could not interfere with it.

Senator SCHMITT. There are different interpretations of detailed provisions of the treaty as to whether interference is possible or not. There is a mechanism, as I recall in my most recent reading of the treaty, which, unfortunately, was some weeks ago, by which if it was presumed that something was going on, a group of countries could insist on inspection.

Dr. FROSCH. Yes. There is an inspection provision. Whether inspection is interference is another question.

Senator SCHMITT. Yes, it is another question. Isn't there in the treaty some obligation implicit, if not explicit, to share the benefits of space activities?

Dr. FROSCH. There is a general obligation to share the benefits.

Senator SCHMITT. Wouldn't that have a chilling effect on industrial investment in space?

Dr. FROSCH. Only if investors insist upon having everything without sharing any result of the investment.

Senator SCHMITT. It is like a windfall tax; isn't it? You have not discovered the oil yet, but you know you will have to pay or have an added cost in the form of a tax. You have not developed the resource. You have not started manufacturing ball bearings in space or mining the titanium and hydrogen of the Moon, but you already know you will have to pay something out that your stockholders will not get.

Doesn't that have a chilling effect on investment?

Dr. FROSCH. Only if you insist upon being chilled. I am not all that sympathetic with that. It is so general a statement that it is hard to be certain that it is, in fact, something that will be chilling. Subject to future negotiation. Everything is subject to tax somewhere and all taxes in the United States are subject to future actions of the U.S. Congress. So no investor is sure of what will happen to his investment 5 years from now or 10 years from now. It is simply not clear to me that this general statement that you should be for the general good is, in fact, a more chilling thing than the prospect of future taxes in the United States.

Senator SCHMITT. Except it is presumably subject to bureaucratic negotiation and not taxation by elected representatives of you and your peers.

Dr. FROSCH. Senator, I believe U.S. taxes are subject to bureaucratic negotiation.

Senator SCHMITT. They are, but the basic tax law is created by economists, and it is not clear that under a treaty of this kind, the tax, the sharing of benefits, will be something over which the elected representatives of the country have any control.

Dr. FROSCH. But I presume, if I understand the structure of the treaty, that whatever regime were to be negotiated, would be a treaty matter and that in itself would have to be ratified by the U.S. Senate. That is, it would not simply be a matter of ratifying this treaty and then all else following automatically without reference to Congress. In that sense, it would be a matter of congressional legislation.

Senator SCHMITT. We will have to explore that in more detail as we understand this treaty. That is one purpose of the hearings. I think it is safe to say that within the investor community, there would have to be some uncertainty, much more so than when you are dealing with just basic U.S. tax law. There is plenty of uncertainty there, but we sort of decided to agree to live with that. When you start throwing international treaties in this—LOS is a good example. It had a tremendously adverse effect on the rapid development on the technologies and management systems to work the resources of the deep sea.

Dr. FROSCH. It certainly had exactly that effect. But it is rather curious to me that it had that dramatic effect, because the negotiations have gone on sufficiently long that some of the investors would probably have crossed their break-even point, if they started at the very beginning.

Senator SCHMITT. Well——

Dr. FROSCH. I am not certain how realistically chilling the chilling effect has been, or how much it was a fact that was an effect of the fact that at the point at which there was discussion of the chilling effect, nobody quite saw how to make money out of it anyway. It is a very fuzzy situation, and it is not clear.

Senator SCHMITT. Don't treaties make fuzzy situations even fuzzier?

Dr. FROSCH. Yes, but that was fuzzy all by itself.

Senator SCHMITT. Why do we want to keep adding further brackets of fuzziness to this problem?

Dr. FROSCH. I started out by saying I was by no means certain that we should. It is not, in my mind, adding a great deal to the situation.

Senator SCHMITT. Thank you, Mr. Chairman.

Senator STEVENSON. Would the Lunar Polar Orbiter be a good first step toward the exploitation of lunar resources?

Dr. FROSCH. It would be a useful step in exploitation, because it would give us a more detailed survey of some of the materials on the Moon. There is no question it would be a piece of a whole program to do that.

Senator SCHMITT. I would just add that is an interesting point, Mr. Chairman, but based on existing information, we have good

insight into the nature of potential resources on the Moon and where large amounts of those resources, in terms of the maximum concentration of them exist—titanium in the area around Taurus littoral seems to be maximized in terms of concentration for near-site deposit. That is based on existing sampling information, as well as on remote sensing from orbit. The hydrogen content of all the soil is high, so that basically it is going to be wherever you happen to decide to exploit resources.

The silicon-aluminum resources are fairly well distributed, more so in the highlands and in the Mare area. So we have a great deal of information right now, and I suspect if the return on investment was clear, the time frame in which it would be there was clear, and there was a considerable certainty on that return on investment, that the investment decisions would be made on economic grounds and not on whether we knew where to go to exploit those resources.

I am speaking a bit with an economic geologist hat on, which I used to be, but we really have a great deal of information. The main difference between the Moon and Earth is there are no high concentrations of the metals and materials that we normally think of as strategic minerals here on Earth. The difference being that the Moon is essentially an anhydrous body. The Earth is hydrous. Its hydrothermal systems concentrate these resources for us in Earth along fractures and other types of locations—that apparently appeared to operate on the Moon. There is no evidence it has. There we deal with a different kind of concentration of resources, and we pretty well understand that. It's as if we were looking with everything stripped off at the bush veldt complex in Africa. Once you know there is something there, you know it will occur over broad areas, and you would immediately begin exploitation plans based on economics. Not on the uncertainty of the availability of resources.

Dr. FROSCH. I would agree with that. I believe the question is whether and when we have a technology that makes it economical, in the sense of a reasonable investment for a good return to use abundant solar energy to drive entropy in such a direction, that you can extract useful quantities of materials that are highly dispersed among a lot of other materials. That is what the problem really is. Energetically, in principle, we know how to do this but do not have a technology for doing it in an economical way.

Senator STEVENSON. Thank you, Dr. Frosch.

[The following information was subsequently received for the record:]

QUESTIONS OF THE COMMITTEE AND THE ANSWERS THERETO

Question 1. You state that extraterrestrial resources are clearly potential resources for inhabitants of Earth. What is your view as to the importance of these resources to the U.S. compared with the importance of other sources such as the seabed and substitutions derived from new technology?

Answer. The availability of materials resources for terrestrial applications is determined by the technological capability to explore, acquire, and convert those materials to useable forms on an economically attractive basis. Clearly, in the short term, materials substitutions are being used to fulfill enhanced performance requirements in the face of increased limitations on traditional materials supply. However, over a longer time, materials resources will be found in relatively inaccessible locations or in decreasing natural concentrations. Such locations include deep mines, the seabed, and space, all of which represent harsh environments which will

require access by automated or remotely operated methods. At this time, none of these technologies has been defined and developed.

Deep mines and the seabed are excellent sources of concentrated ore deposits which may be obtained at increased cost due to difficult access. Extraterrestrial resources involve difficult access for terrestrial use at current and projected costs of space transportation, and vary from virtually undifferentiated structure, such as the Moon, to high concentration as on some asteroids. A principal value offered by non-terrestrial resources will be in construction of space-utilized equipments. As the space technology required for non-terrestrial resources access matures, the relative advantage of using non-terrestrial materials in space may advance sufficiently to offset plant and operating costs for creating space-based processing and fabrication facilities. Such non-terrestrial materials mining and processing, once in place for space construction, may become an alternate source of materials for terrestrial use.

Technology advances for all material sources will enable greater ease of access to remote resources through the use of teleoperated and robotic systems. Such technology may be applied to development of new processes for extraction of useful materials from undifferentiated soils, both for Earth's gravity and water-abundant environment, as well as alien environments including the zero-gravity, waterless character of free space. NASA's role involved establishment of specific systems for the acquisition and conversion of space materials into useable forms. When such technologies have been developed, economic principles will determine the extent of the utilization of such materials in terrestrial markets.

Question 2. In your judgment, are there any insurmountable technological impediments to the exploitation of extraterrestrial resources? From NASA studies of a "Space Materials System," is it technologically and economically feasible to develop such a system including mining the Moon or an asteroid for the raw materials? In your best judgment, what is the earliest date at which the U.S. could expect to begin the exploitation of extraterrestrial resources, and what funding levels—in a gross sense—would be required?

Answer. Based on NASA studies to date, there are no insurmountable technological impediments to the exploitation of extraterrestrial resources. However, in order to make such ventures economically competitive, methods must be developed to process materials and fabricate system components in the unique environment of space while at the same time, minimizing transportation charges and operational costs. Such system concepts are being studied to identify the necessary technology development and enable economic assessments to be performed. The introduction of teleoperated and robotic systems technology appears to the enabling key to the exploitation of the space resources of energy and materials.

Although estimates of the time required to make extraterrestrial resources available are difficult, it is thought that in the period 2000 to 2010 a viable capability could be tested through a technology readiness demonstration. Implementation of operational capability would require further time. It is likely that an economic investment of at least the scale of the Apollo program would be necessary to achieve this goal.

Question 3. In a study prepared for the Committee by the Office of Technology Assessment, the following statement appears: "NASA officials believe that, even assuming an ambitious future U.S. space applications program, using lunar resources would not appear to be justified unless a program of the dimension of a Satellite Power System (SPS) were involved." Does this statement correctly reflect your views? Do you think that also applies to other celestial body resources for example, near Earth asteroid resources?

Answer. It would be inappropriate to relate the development of space materials technologies to specific engineering projects such as the Satellite Power System (SPS) design concept, regardless of size. Although recent studies have indicated that extraterrestrial materials could be a primary source for the construction of large space structures such as the Satellite Power System, the quoted statement simply reflects the fact that using lunar, asteroidal or planetary materials for future space missions entails capabilities which have not yet been developed. The Satellite Power System represents a design concept that was convenient for the OTA study program, but is by no means being proposed by NASA for implementation with either terrestrial or lunar materials.

While it is clear that silicon, aluminum and iron, among other elements, are available on the lunar surface, our current knowledge of the asteroids is comparatively far less. Use of other planetary bodies presents even greater difficulties of both distance and environment and assessments of materials utilization potential is correspondingly more speculative.

The complexity of making space materials available for future missions in space is sufficient that it will be necessary first to define and develop the necessary

66-705 O - 80 - 4

generic technologies. Some requirements are already clear: methods for processing materials and manufacturing useful objects must be adapted to the space environment as well as to the extensive use of machine intelligence and robotics. Further, such systems must be capable of a high degree of autonomy and even of self repair and replication of components from in situ celestial materials. The technologies will be generic and not tied to a particular mission, although specific methods will depend upon both the mission tasks and the particular source of raw materials.

The technology development for exploitation of extraterrestrial resources will involve an evolutionary process and will entail examination of numerous technology development alternatives. Costs for such alternative approaches have not been fully estimated at this time; but the options could cover a substantial range, from activities such as propellant acquisition, to large space structure and spacecraft construction, to asteroid retrieval to Earth.

Senator STEVENSON. The next witness is S. Neil Hosenball, chairman, U.S. delegation, U.N. Committee on the Peaceful Uses of Outer Space; also General Counsel to NASA.

STATEMENT OF S. NEIL HOSENBALL, CHAIRMAN, U.S. DELEGATION, UNITED NATIONS COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE, 1979; GENERAL COUNSEL, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Mr. HOSENBALL. As you know, I appear here today wearing a different hat, if you will, than I normally wear when I attend sessions of this committee or when on prior occasions I have been called upon to testify before this committee. I have been requested by the committee to appear and testify in my role as Head of the U.S. Delegation to the 1979 session of the United Nations Committee on the Peaceful Uses of Outer Space, COPUOS, which took place in New York June 18 through July 3, 1979. It was at this session of the U.N. Committee on the Peaceful Uses of Outer Space that consensus was reached on the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies."

By way of background, on December 13, 1958, 1 year after the launch of Sputnik by the U.S.S.R. and almost simultaneously with the establishment of NASA, the United Nations established an Ad Hoc Committee on the Peaceful Uses of Outer Space. The creation of such a U.N. committee was an initiative of the United States.

The 18-nation Ad Hoc Committee subsequently created as a result of this U.S. initiative was to report to the 14th General Assembly, 1959, on the activities and resources of the United Nations, its specialized agencies, and other international bodies in this field, proposals for coordination of research programs, exchange of information, and organizational arrangements to facilitate such cooperation and the nature of legal problems related to outer space exploration.

On December 12, 1959, by General Assembly Resolution 1472 (VIV) the present standing Committee on the Peaceful Uses of Outer Space was established consisting of 24 members. As the Commerce Committee print indicates, membership was increased to 28 in 1961, to 37 in 1974 and in 1977 to its current 47 members. It should be noted that in the short span of 4 years the membership almost doubled from 28 to 47. At the committee session just completed this past July 3, the Peoples Republic of China requested and received observer status with the committee which may presage their requesting membership on the committee.

This brings me to the work of the committee and in particular its legal subcommittee over the past 20 years, and more specifically

to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.

In the short span from 1958 to 1974 the legal subcommittee produced four space treaties which have entered into force; Treaty on Principles Governing the Activity of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, which entered into force for the United States on October 10, 1967; the Agreement on the Rescue of Astronauts and the Return of Objects Launched into Outer Space, December 3, 1968; the Convention on International Liability for Damage Caused by Space Objects, October 9, 1973; and the Convention on Registration of Objects Launched into Outer Space, September 15, 1976.

The fifth treaty, the Agreement Governing the Activities on the Moon and Other Celestial Bodies, has not entered into force for any country.

Let me refer back to my earlier testimony on the 1959 Report of the Ad Hoc Committee on the Peaceful Uses of Outer Space where certain legal problems were identified as requiring early treatment and others identified that could be addressed later. Between the years 1958 and 1970 all five problems identified for early treatment had resulted in treaties or were on the agenda of the legal subcommittee. By 1970 the question of freedom of outer space for exploration and use had produced the 1967 Outer Space Treaty.

Liability for injury or damage caused by space vehicles had been on the agenda of the legal subcommittee for many years with only two issues remaining to be resolved to reach consensus on a liability convention. Consensus was in fact reached in 1972.

Allocation of Radio Frequencies—the International Telecommunications Union had assumed jurisdiction and had issued its radio regulations dealing with space frequencies.

Identification and Registration of Space Vehicles and Coordination of Launchings—the question of identification and registration had also been on the agenda for many years and the issues by 1970 had narrowed to the information to be furnished by launching states and marking of vehicles and their component parts. Consensus was reached in 1974 and the Registration Convention effectively disposed of this question.

Reentry and Landing of Space Vehicles—dealt with by the 1968 Astronaut Rescue and Return Agreement.

It is therefore not surprising that Argentina and the U.S.S.R. delegations, both of whom had been very active through the years in submitting draft instruments on the various agenda items before the legal subcommittee, would turn to the other legal problems that had been identified in the 1959 Ad Hoc Committee report.

An examination of these other legal problems shows that definition of outer space, that is, where airspace ends and outer space begins, had also been on the agenda for many years with little or no progress having been achieved and no draft treaty having been submitted for negotiation by the legal subcommittee. Safeguards against a contamination of or from outer space had been treated in the 1967 Outer Space Treaty and measures were being taken by the space powers to prevent such contamination. Avoidance of interference among space vehicles—based on the experience of prior years, this question still appeared to present no problems.

What was left were questions relating to exploration of celestial bodies. Man had safely landed on the Moon and had safely returned with lunar samples and it is therefore equally not surprising that Argentina in July 1970 proposed a draft agreement on the principles governing activities in the use of the natural resources of the Moon and other celestial bodies. In May 1971 the U.S.S.R. requested the General Assembly consider the "Preparation of an International Treaty Concerning the Moon" and this item accompanied by a U.S.S.R. draft treaty proposal appeared as a priority item on the agenda of the legal subcommittee which met in Geneva in the spring of 1972.

Having explained how and why I believe these draft proposals appeared on the 1972 agenda, let me proceed to a discussion of the negotiation history leading to the consensus reached on the "Agreement Governing the Activities of the Moon and Other Celestial Bodies."

The committee print prepared at the request of the chairman of the Committee on Commerce, Science and Transportation on pages 7 through 44 fairly represents the history of negotiations on the three outstanding issues which prevented a consensus being reached sooner than 1979. But as indicated in the committee print, a detailed account of the process could amount to several volumes, consisting of drafts of articles submitted by delegations and made part of the record, 8 years of summary records of legal subcommittee, the reports of the legal subcommittee for the years 1972-79, the verbatim records of the full committee and the reports of the full committee for those years, and the records of the General Assembly.

The American Law Institute in its Restatement of the Foreign Relations Law of the United States, page 453, defines negotiating history as:

> Drafts circulated by delegations, official declarations of policy made during the negotiations, reports of committees and subcommittees of the conference made during the conference, and in general, all manifestation of intention made during the course of the negotiation, provided that such manifestations are contained in the official records of the conference available to the negotiators.

Unilateral statements of interpretation made in the course of negotiations of a treaty constitute part of the negotiation history and are appropriately and frequently used in international law in the interpretation of the treaty text. The effect of a unilateral statement made after negotiations have ended but before the treaty is approved by the United Nations General Assembly for the period between the end of direct negotiations and the formal adoption of the text by the General Assembly is also considered part of the negotiating history.

The uncontradicted statements made by the United States on the public United Nations record of negotiations, the defeat of specific proposals by other delegations, the reference to agreed understandings in the committee report and the General Assembly Resolution adopting the treaty in my view conclusively establish as a matter of treaty interpretation that:

One, a state may remove and exploit natural resources from the Moon and other celestial bodies. This conclusion is in part based on the uncontradicted statement of the U.S. Representative, April 19,

1973. The phrase "in place" appears in Article 11, paragraph 3, and was, as indicated, proposed by the United States.

Two, there is no moratorium in the treaty on exploitation of natural resources either preregime or if a state chooses not to become a party to the treaty establishing such a regime. Proposals for such a moratorium were submitted for the record by India, Italy, and other delegations. No such provisions appear anywhere in the treaty and the United States through numerous statements in the record said it would not accept a moratorium.

Three, the treaty does not apply to trajectories and orbits of space objects in Earth orbit only or trajectories of space objects between the Earth and Earth orbit. 1979 COPUOS Report, paragraph 63, U.N. General Assembly Resolution A/Res/34/68. Committee reports which address particular questions of treaty interpretation, especially if adopted without question, would be legally conclusive with respect to the questions of interpretation they address.

Four, the United States can carry out exploitation of the natural resources of the Moon or other celestial bodies through the use of public or private entities.

As is recited in the history of negotiations in the committee print, it was the U.S.S.R. that blocked a consensus being reached during the years 1973 to 1979 based on their objection to the inclusion of the common heritage language in the treaty. They finally did not block a consensus when, as a result of extensive informal discussions, article 11, paragraph 1 was amended by including the phrase "which finds its expression in the provision of this agreement."

The nonspace powers on COPUOS, both developing and developed countries, viewed the Moon Treaty as another treaty between and for the sole benefit of the space powers. They argued they had received minimal benefit from the 1967 treaty and no benefit from the 1968 Rescue and Return Agreement. They viewed the Liability Convention as not providing any space benefits to them, but merely providing them compensation for injuries or damages they might suffer as a result of space activities by the space powers.

Many of the countries represented on COPUOS were also members of Intelsat and viewed the Intelsat Agreement as the only space agreement providing a direct and tangible space benefit. They therefore viewed article XI as the only article which at least provided an opportunity to the nonspace powers to negotiate some "equitable sharing" arrangement when lunar or other celestial body resources proved commercially exploitable.

The United States for its part pressed hard for articles on mandatory reporting of activities; noninterference; consultation; and safeguarding, protecting and assisting all persons who might be on the Moon or a celestial body, provisions the United States has and would follow in the absence of a treaty, but which would by treaty require the U.S.S.R. also to follow. The United States also sought to assure that this treaty did not prevent the start or continuation of national programs for the scientific and commercial exploration, use and exploitation of the Moon and other celestial bodies.

A partial listing of these provisions is contained.

In addition, article 9, paragraph 1, provides that state parties may establish manned or unmanned stations on the Moon, and in so establishing such stations a state party shall use only that area which is required for the needs of the station, shall inform the Secretary General of the United Nations of the location and purpose of that station; and at annual intervals states are required to inform the Secretary General whether the station continues in use and whether its purposes have changed.

Under our system of government I have little doubt that U.S. activities whether carried out by the Government or private enterprise would be in compliance with this article even in the absence of such treaty language. The U.S.S.R. and other states who become parties to the treaty would be required to conform to this provision.

Also, article 9, paragraph 1, taken in conjunction with article 9, paragraph 2—shall not impede free access to all areas of the Moon—article 8, paragraphs 1, 2, and 3—pursuit of activities anywhere on or below its surface; place facilities, stations and installations on or below the surface of the Moon; and states shall not interfere with the activities of other state parties on the Moon—and article 11, paragraphs 2 and 3—no sovereignty, no ownership—if applied to a mining facility in effect establishes procedures which I believe parallel mining operations on public lands in the United States; that is, locating an area having potential mineral resources, staking out the claim, filing the location of the claim with a central office, and the requirement to work the claim or it is considered abandoned.

The filing of the location of a claim does not transfer ownership of the public land to the claimant and similarly under the Moon Treaty the use and occupancy of an area of the Moon does not transfer ownership of that area of the Moon.

The noninterference provision of the treaty does in effect give the state party or private enterprise party, acting under authority of a state party, the equivalent of an exclusive privilege to mine the claim at the location reported to the Secretary General.

These treaty provisions also limit the area that can be mined to that which is required to conduct the mining operation, thus preventing a single state from excluding others from areas it is not using for such operations. Thus the Moon Treaty does contribute to the continuing development of space law and does provide more certainty than currently exists under the 1967 Outer Space Treaty.

The treaty also contains a review provision, article 18, which can trigger an examination of the treaty 10 years after entry into force of the treaty, or by request of one-third of the state parties, with the concurrence of the majority of the state parties, at any time after the treaty has been in force for 5 years. If at any time after the treaty has been in force for 5 years there is a clear indication of an unwillingness by U.S. private enterprise to invest in the exploitation of the lunar resources solely for the reason of the uncertainty as to what the future international regime will look like, a review conference could be requested to consider a revision or if appropriate the implementation of article 11.

Finally, under article 20 of the treaty any state party may give notice of its withdrawal 1 year after the treaty enters in force with withdrawal taking place 1 year after such notice has been given.

I have tried in this statement to at least touch upon the events leading up to the introduction of the Moon and Celestial Bodies Treaty, the history of negotiations, and the interpretation of some of its provisions and where possible to avoid duplicating material already contained in the studies that were prepared at the request of the committee, or addressed by other witnesses.

This concludes my statement.

Senator STEVENSON. Thank you, sir. That was a very helpful statement.

What concessions did the U.S.S.R. and the United States have to make to finally produce this consensus?

Mr. HOSENBALL. The concession—the only concession I think the United States made was that some of the provisions where we requested advance notification now basically read "notification to the extent feasible and practical," which does not convert basically to advance notification.

There are provisions that do require advance notification but not in every instance is notification in advance required. The Soviet Union throughout made a whole series of concessions, as I view it.

There was a provision in their draft treaty which our delegation believed could be interpreted to exclude the use of other entities than states or state organizations in exploitation or in exploration. That was subsequently dropped by the Soviet Union.

The Soviet Union wished to limit the treaty to the Moon. They subsequently agreed that the treaty would govern other celestial bodies. The Soviet Union for almost the entire period from 1972 until we finally reached consensus would not agree to common heritage language in the treaty. That one issue, I think, more than anything else delayed a consensus being reached.

There were some other minor concessions, I would suspect, made not only on our side but on the Soviet side, and certainly by the developing countries, as well as by the other members of the committee.

That basically, as I see it, were some of the things that entered into a consensus finally being reached.

Senator STEVENSON. You mentioned the Argentinian and Soviet drafts. I think this leaves the impression that the final negotiating text was the one laid down by the Soviets in 1972. In 1977 or 1978, an Austrian draft treaty was circulated which became the basis, did it not, for the final agreement?

Mr. HOSENBALL. If you examine the 1971 Soviet proposal, you will find some elements of the Soviet proposal in the final text, but there is a great deal of difference between what was in the Soviet proposal and what was finally agreed to.

Reference is made to an Austrian text, but it really isn't the Austrian text in the sense that it was developed or proposed by Austria itself. You might call it a negotiating text which combined proposals of various delegations over the years and used as a basis for discussions and negotiations.

You are right, Mr. Chairman. It was that negotiating text that for several years was discussed and which did finally form a basis for the consensus that was reached in 1979.

Senator STEVENSON. How will this treaty affect U.S. technology development, if at all?

Mr. HOSENBALL. I don't think it affects—well, in what sense, Mr. Chairman? Whether it would impede——

Senator STEVENSON. United States space policy and the development of technology for the exploitation——

Mr. HOSENBALL. I am satisfied there is nothing in the treaty that prevents development of the technology certainly by NASA or any other Government agency. There is the issue whether it would in some way impede commercial entry into this area. I don't think there is a legal moratorium. I do think industry does have to assess any risk.

Somebody reminded me the other day that the British government took 50 percent equity in the North Sea oil and yet American and other oil companies made substantial investments. I think industry makes investments in some very troubled foreign countries.

I believe it is up to industry, frankly, to decide what risk they are willing to take. There is nothing in this treaty that prohibits them or restricts them from taking that risk. I think they will have to decide at what point in time, based on investment, they would be willing to take the risk.

Senator STEVENSON. In your opinion, should it encourage and facilitate space policymaking and commercial entry by creating more certainty and a better framework than exists now?

Mr. HOSENBALL. I think it creates more certainty. Whether by itself it will create the incentive to move ahead, either by the U.S. Government or private enterprise, remains to be seen.

I think it does create more certainty in the ways I tried to testify to in my statement. You wouldn't have fishing wars, if you will, where somebody comes across and cuts your lines. There is a treaty obligation not to interfere. In effect, you do have an exclusive privilege to use a particular area, whether for mining or space colonization.

So I think it does, in my view, contribute to future space policy in that sense.

Senator STEVENSON. Senator Schmitt.

Senator SCHMITT. Thank you, Mr. Chairman.

Thank you, Mr. Hosenball, for a fine statement, and your fine work on this subject. I am hopeful you will remain a resource that the subcommittee and committee can draw on as we try to understand various implications of the treaty as you see them from the legal point of view.

I would only criticize you for choosing the public land analogy. That analogy is rapidly breaking down in the United States and continuous areas. It's very difficult to exploit the resources of public lands these days in spite of the analogy that you developed. That may actually work against you if it's examined very closely.

Did you have any kind of nongovernmental advisory group working with you on the negotiations of the treaty?

Mr. HOSENBALL. Not that I know of, Senator. I can't speak for the State Department, but I was involved for almost 10 years as a member of the delegation, particularly during the years that the treaty was being negotiated. I don't recall any outside advisory committee, no, sir.

Senator SCHMITT. As I understand it, the Law of the Sea negotiations do have a formal private sector advisory group associated with it.

Mr. HOSENBALL. I believe that's correct. There was a very large delegation 1 year when they were meeting at the same time we were.

Senator SCHMITT. Do you feel this was putting you at a disadvantage in terms of negotiating the legal aspects of the treaty? Not having a continuous input from an outside advisory group?

Mr. HOSENBALL. I don't know. I don't know whether it would be good or bad. It probably might have helped if you had a broader number of people involved and other interests involved. I don't think it would have changed anything necessarily.

Senator SCHMITT. As a negotiator, could you see any effect over that 10-year period, the effect of the relatively high and continuous level of Soviet activity versus the cyclic nature and downturn of United States activity in space?

Mr. HOSENBALL. I think again this would have to be a personal observation. I think most of the developing countries, based on our rather open space program and the amount of international cooperation we have conducted with other countries, feel more relaxed about what the United States would do.

I think they were concerned not only about being left out, but I think they were concerned on what the space powers would do, and in particular, what the Soviet Union would do—were doing, if you will.

Senator SCHMITT. The Soviets over the last decade have demonstrated a much more consistent purpose to their activities in space than has the United States. We have produced major things, but we don't seem to tie it together with any overall purpose.

It should be evident to the rest of the world that the Soviets do have a very strong, continuous purpose, although they may not fully understand what that purpose is. It appears to be very purposeful in its activities in space.

Did this environment and the perception of that environment have any impact on the negotiations that you could see?

Mr. HOSENBALL. The developing countries and other countries besides the United States pushed very hard on the information point, wanting to know what was going on in space and, if at all possible, getting advance notice.

So you do find in the treaty a large number of references to making information available. That was not only our doing but it was the doing of other countries as well, if you examine the negotiating history. So to that extent, I think there was a perception of a vigorous Soviet program which they knew very little about. They pretty much without question knew what the U.S. program was all about.

Senator SCHMITT. They did?

Mr. HOSENBALL. I think so.

Senator SCHMITT. Maybe we can get them to testify.

Mr. HOSENBALL. I said program, not policy.

Senator SCHMITT. In that regard, the other side of the coin is: Did you feel any effect of the lack of a specific set of policy goals in contrast to programs?

Mr. HOSENBALL. I think——

Senator SCHMITT. In your negotiations on this treaty.

Mr. HOSENBALL. There was reference to the fact that in 1972 and subsequent years it appeared quite likely that we would not have lunar exploration for quite some time. That, of course, does bear on the question of exploitation of lunar resources. I think that fact was well known and other countries commented on it and wondered why, if you will, we had an interest in lunar resources. I thought, and others did as well, that one day we certainly will return man to space and hopefully one day we will return man to the Moon or some other planet. That may be a long time away. Basically, one of the reasons why you have this two-step process in the treaty for developing a legal regime for exploitation of resources was because of some uncertainty in our program and some uncertainty in knowing what the Soviets were actually doing.

Senator SCHMITT. Are you implying there was a change in the negotiating environment, say, between 1970 and 1972 where in 1970 most of these countries perceived us as moving vigorously toward exploitation of the Moon and in 1972 it was obvious we weren't going to do that?

Mr. HOSENBALL. I don't think there was a change in negotiation postures at all. I think there was a recognition that we would be completing a lunar landing program and that there was nothing——

Senator SCHMITT. In 1969 and 1970 there was a tremendous amount of other plans. We were working on all sorts of things.

Mr. HOSENBALL. I am talking 1972.

Senator SCHMITT. The momentum seemed to be for the United States to move forward with a continuous lunar exploration program and implicit in that is the potential exploitation of resources on the Moon in the foreseeable future, whereas in 1972 that all changed. The Nixon administration cancelled all those activities and it became obvious to the world we would not do that. As far as the United States was concerned, we were adrift with respect to a purpose in our space activities. Whereas about the same time it became increasingly evident that certainly within a couple of years of that time the Soviet Union was going to move steadily forward in their activities in near-Earth space at any rate, whatever the purpose behind those activities may be.

These kind of environmental swings and changes didn't affect the negotiations in any way?

Mr. HOSENBALL. I don't believe so. Of course, I can only speak of the general impression I have. I can't speak for other delegations that participated. I think people in 1972 did perceive there would be a completion of a United States on the Moon program.

Senator SCHMITT. Was anyone on the group negotiating who had any experience in mining operations?

Mr. HOSENBALL. No, sir.

Senator SCHMITT. Isn't that an awfully vague term when you say there will be no interference with mining operations but without defining what it was?

Mr. HOSENBALL. It doesn't talk in terms of a mining operation. I used it as an analogy.

Senator SCHMITT. I guess the thing I am getting at is that a mining operation has to be defined in terms of available reserves for whatever period of time the stockholders expect a return on investment, minimum amount of reserves, and if there isn't some more explicit definition somebody—you could start your operation and somebody parks down next to you and forecloses the development of sufficient reserves to make the operation economically feasible but you already started it when that happened.

Mr. HOSENBALL. There is nothing in the treaty that requires you to give up the location within any particular time as long as you are using it.

Senator SCHMITT. The location is a much broader area than the specific mining operation.

Mr. HOSENBALL. If you circumscribe an area——

Senator SCHMITT. That means you lay claim to it.

Mr. HOSENBALL. In effect, you have a right to use that area and to exclude others.

Senator SCHMITT. Without the ability to lay legal claim internationally, that is precluded by the treaty. Right? How can you define a mining operation?

Mr. HOSENBALL. You are not laying claim of ownership to the underlying area. You in effect have the right within the area you circumvent to remove the natural resources in that area.

Senator SCHMITT. If I haven't removed it, how can I lay claim to it?

Mr. HOSENBALL. Because you are there and you established a location where you are intending to carry out activities.

Senator SCHMITT. Let's leave this but this is an area we must clarify. It may take an understanding of the treaty to clarify it. There is this basic conflict between not being able to lay internationally valid legal claim and conducting an operation that is going to exploit resources.

The fact that mining law developed over a century or two is not accidental. It's there for a purpose. It's there in order to allow the exploiter to define enough available resources in order to have a viable economic operation. In the treaty we are saying that wouldn't happen in space. So there has to be a very clear understanding that if there is a claim, there is a de facto claim. Otherwise you wouldn't exploit that resource. You wouldn't get anybody within 10 million miles of that resource.

Mr. HOSENBALL. I think there is a de facto claim.

Senator SCHMITT. It better be darn clear there is. As it stands now it's clearly inconsistent on its face. You can't have a legal claim but you can mine and exploit the resource. You don't mine and exploit the resource instantaneously. It happens over decades of time. If in that decade of time you don't have a valid claim for the area you need to make that resource economically viable and then you have a problem. Thank you, Mr. Chairman.

Senator STEVENSON. This right sounds to me like a right that is acquired under a typical oil and gas or mining lease. It doesn't convey title or ownership in the land, just the right to explore and develop.

Mr. HOSENBALL. But you can't lay claim to anything until you are up there.

Senator SCHMITT. Mr. Chairman, if you would yield, within mining leases there still is a boundary to the legal claim of the lease. Unless I misunderstand the Moon Treaty, and I probably have in many respects, we are saying there will be no lease, no legal boundary to the area that is the exploitable resource for a single operation. That is my concern.

Mr. HOSENBALL. The treaty has a provision that says you may use such area that is necessary to carry out your activities. That is the way it's phrased.

Senator SCHMITT. Carry out activities or carry out an economic exploitation of the resource?

Mr. HOSENBALL. I would consider that an activity. I think if and when it happens, like mining, you have the development of the way it is carried out and will establish an interpretation, if you will, and give some additional gloss to the words that are in the treaty. I think that is the way law does develop.

Senator SCHMITT. Well, usually those things happen simultaneously. Not 30 years before the fact.

Mr. HOSENBALL. Not necessarily.

Senator STEVENSON. We have a few more questions which I will have to submit in writing. If there are no more now, thank you very much.

Senator SCHMITT. I think Mr. Hosenball can expect a lot of questions for the record.

Mr. HOSENBALL. I wish you would direct some to the Department of State. I do work for NASA and have other things to do.

[The statement follows:]

STATEMENT OF S. NEIL HOSENBALL, GENERAL COUNSEL, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Mr. Chairman and Members of the Subcommittee: I appear here today wearing a different hat, if you will, than I normally wear when I attend sessions of this Committee or when on prior occasions I have been called upon to testify before this Committee. I have been requested by the Committee to appear and testify in my role as Head of the U.S. Delegation to the 1979 session of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) which took place in New York June 18 through June 3, 1979. It was at this session of the U.N. Committee on the Peaceful Uses of Outer Space that consensus was reached on the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies."

By way of background, on December 13, 1958, on year after the launch of Sputnik by the USSR and almost simultaneously with the establishment of NASA, the United Nations established an Ad Hoc Committee on the Peaceful Uses of Outer Space. The creation of such a U.N. Committee was an initiative of the United States proposed by Secretary Dulles in an address to the General Assembly on September 8, 1958. At the invitation of Secretary Dulles on behalf of President Eisenhower then Senator Lyndon B. Johnson, Chairman of the Senate Committee on Aeronautical and Space Sciences, addressed the First Committee of the U.N. General Assembly on November 17, 1958, and supported the proposal for an ad hoc committee, making it clear that the Executive and Legislative Branches of the United States Government were united in support of the principle of the peaceful uses of outer space.

The 18-nation Ad Hoc Committee subsequently created as a result of this U.S. initiative was to report to the 14th General Assembly (1959) on the activities and resources of the United Nations, its specialized agencies, and other international bodies in this field; proposals for coordination of research programs, exchange of information, and organizational arrangements to facilitate such cooperation; and the nature of legal problems related to outer space exploration.

The Ad Hoc Committee issued its report on July 14, 1959, and in response to the mandate of the General Assembly to identify the nature of legal problems related to outer space exploration separated the legal problems into two groups, those susceptible of priority treatment and those that were not.

Those in the first grouping (priority) were:

A. Question of Freedom of Outer Space for Exploration and Use;

B. Liability for Injury or Damage Caused by Space Vehicles;

C. Allocation of Radio Frequencies;

D. Avoidance of Interference between Space Vehicles and Aircraft;

E. Identification and Registration of Space Vehicles and Coordination of Launchings;

F. Reentry and Landing of Space Vehicles.

Legal problems identified in the second group (non-priority) were:

A. Question of Determining where Outer Space Begins;

B. Protection of Public Health and Safety: Safeguards Against a Contamination of or from Outer Space;

C. Questions Relating to Exploration of Celestial Bodies;

D. Avoidance of Interference among Space Vehicles.

Since your interest today is directed to the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies" let me read the Ad Hoc Committee's report dealing with C above, questions relating to exploration of celestial bodies:

"30. The Committee was of the view that serious problems could arise if States claimed, on one ground or another, exclusive rights over all or part of a celestial body. One suggestion was that celestial bodies are incapable of appropriation to national sovereignty. Another suggestion was that the exploration and exploitation of celestial bodies should be carried out exclusively for the benefit of all mankind. It was also suggested that some form of international administration over celestial bodies might be adopted.

"31. The Committee noted that, while scientific programmes envisaged relatively early exploration of celestial bodies, human settlement and extensive exploitation of resources were not likely in the near future. For this reason the Committee believed that problems relating to the settlement and exploitation of celestial bodies did not require priority treatment."

On December 12, 1959, by General Assembly Resolution 1472 (VIV) the present standing Committee on the Peaceful Uses of Outer Space was established consisting of 24 members. As the Commerce Committee Print indicates membership was increased to 28 in 1961, to 37 in 1974 and in 1977 to its current 47 members. It should be noted that in the short span of three years, the membership almost doubled from 28 to 47. At the Committee Session just completed this past July 3rd, the Peoples Republic of China requested and received observer status with the Committee which may presage their requesting membership on the Committee.

Also as noted in the Commerce Committee Print the U.N. Committee on the Peaceful Uses of Outer Space has two subcommittees, the Legal Subcommittee and the Scientific and Technical Subcommittee. All members of the full Committee are members of the Subcommittee and the Committee works on the basis of consensus. In the context of the work of the Committee consensus means the absence of voting. The members seek to resolve conflicting positions through debate and persuasion rather than by majority vote. Reaching consensus in the Committee or Subcommittee does not mean that all members are in unanimous agreement and in the case of a Treaty that they will become parties to the Treaty. It means rather that no member wishes to in effect veto an action of the Committee that may have the overwhelming support of the other delegations. Other courses are available to the delegation to express their views, their understandings or their positions through statements on the record of the Committee, through their ratification process, or reservations attached to signature or ratification.

This brings me to the work of the Committee and in particular its Legal Subcommittee over the past 20 years and more specifically to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies. In the short span from 1958 to 1974 the Legal Subcommittee produced four space treaties which have entered into force; Treaty on Principles Governing the Activity of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies which entered into force for the United States on October 10, 1967; the Agreement on the Rescue of Astronauts and the Return of Objects Launched into Outer Space (December 3, 1968); the Convention on International Liability for Damage Caused by Space Objects (October 9, 1973); and the Convention on Registration of Objects Launched into Outer Space (September 15, 1976). The fifth treaty, the Agreement Governing the Activities on the Moon and Other Celestial Bodies, has not entered into force for any country as there has not been deposited with the Secretary General of the United Nations the requisite five instruments of ratification. As this Subcommittee is aware the Treaty has not been signed by the United States and if

and when signed its ratification will be subject to the advice and consent of the Senate.

Let me refer back to my earlier testimony on the 1959 Report of the Ad Hoc Committee on the Peaceful Uses of Outer Space where certain legal problems were identified as requiring early treatment and others identified that could be addressed later. Between the years 1958 and 1970 all five problems identified for early treatment had resulted in treaties or were on the agenda of the Legal Subcommittee. By 1970, A. Question of Freedom of Outer Space for Exploration and Use produced the 1967 Outer Space Treaty. B. Liability for Injury or Damage caused by Space Vehicles had been on the agenda of the Legal Subcommittee for many years with only two issues remaining to be resolved to reach consensus on a Liability Convention. Consensus was in fact reached in 1972. C. Allocation of Radio Frequencies—The International Telecommunications Union had assumed jurisdiction and had issued its radio regulations dealing with space frequencies. D. Identification and Registration of Space Vehicles and Coordination of Launchings—The question of Identification and Registration had also been on the agenda for many years and the issues by 1970 had narrowed to the information to be furnished by launching States and marking of vehicles and their component parts. Consensus was reached in 1974 and the Registration Convention effectively disposed of this question. F. Reentry and Landing of Space Vehicles—Dealt with by the 1968 Astronaut Rescue and Return Agreement.

It is therefore not surprising that Argentina and the USSR delegations both of whom had been very active through the years in submitting draft instruments on the various agenda items before the Legal Subcommittee would turn to the other legal problems that had been identified in the 1959 Ad Hoc Committee Report. An examination of these other legal problems shows that definition of outer space, i.e., where airspace ends and outer space begins, had also been on the agenda for many years with little or no progress having been achieved and no draft treaty having been submitted for negotiation by the Legal Subcommittee; safeguards against a contamination of or from outer space had been treated in the 1967 Outer Space Treaty and measures were being taken by the space powers to prevent such contamination; avoidance of interference among space vehicles—based on the experience of prior years this question still appeared to present no problems. What was left were questions relating to exploration of celestial bodies. Man had safely landed on the Moon and had safely returned with lunar samples and it is therefore equally not surprising that Argentina in July 1970 proposed a "Draft Agreement on the Principles Governing Activities in the Use of the Natural Resources of the Moon and Other Celestial Bodies." In May 1971 the USSR requested the General Assembly consider the "Preparation of an International Treaty Concerning the Moon" and this item accompanied by a USSR draft treaty proposal appeared as a priority item on the agenda of the Legal Subcommittee which met in Geneva in the spring of 1972.

Having explained how and why I believe these draft proposals appeared on the 1972 agenda let me proceed to a discussion of the negotiation history leading to the consensus reached on the "Agreement Governing the Activities of the Moon and Other Celestial Bodies." The Committee Print prepared at the request of the Chairman of the Committee on Commerce, Science and Transportation on pages 7 through 44 fairly represents the history of negotiations on the three outstanding issues which prevented a consensus being reached sooner than 1979. But as indicated in the Committee Print a detailed account of the process could amount to several volumes, consisting of drafts of Articles submitted by delegations and made part of the record, eight years of summary records of the Legal Subcommittee, the reports of the Legal Subcommittee for the years 1972–1979, the verbatim records of the full Committee and the reports of the full Committee for those years, and the records of the General Assembly.

The American Law Institute in its Restatement of the Foreign Relations Law of the United States, p. 453, defines negotiating history as: ". . . drafts circulated by delegations, official declarations of policy made during the negotiations, reports of committees and subcommittees of the conference made during the conference, and in general, all manifestation of intention made during the course of the negotiation, provided, that such manifestations are contained in the official records of the conference available to the negotiators."

The history of negotiations is used in international law, both under customary international law and Article 32 of the Vienna Convention on the Law of Treaties, as a supplementary means of interpretation of the treaty text. The American Law Institute in its analysis of treaty interpretation notes that the interpretative process is designed to ascertain and give effect to the purpose of the Agreement, which as appears from the terms used by the parties, it was intended to serve.

Unilateral Statements of interpretation made in the course of negotiations of a treaty constitute part of the negotiation history and are appropriately and frequently used in international law in the interpretation of the treaty text. The effect of a Unilateral Statement made after negotiations have ended but before the Treaty is approved by the United Nations General Assembly for the period between the end of direct negotiations and the formal adoption of the text by the General Assembly is also considered part of the negotiating history. The uncontradicted statements made by the United States (on the public United Nations record of negotiations), the defeat of specific proposals by other delegations, the reference to agreed understandings in the Committee Report and the General Assembly Resolution adopting the Treaty in my view conclusively establish as a matter of treaty interpretation that

(1) A state may remove and exploit natural resources from the Moon and other celestial bodies. This conclusion is in part based on the uncontradicted statement of the U.S. Representative, April 19, 1973. The phrase "in place" appears in Article 11, paragraph 3, and was as indicated proposed by the United States.

"One or two particular points should be made concerning these matters as they are reflected in Working Paper 15 which the United States delegation introduced on April 17. As is apparent from the text, this working paper excludes the concept of a pre-regime moratorium. References to the words 'in place' in the first sentence of that paragraph and to paragraph 7 of Article X make this clear. More particularly, the words 'in place' in the first sentence of paragraph 2 are intended to indicate that the prohibition against assertion of property rights would not apply to natural resources once reduced to possession through exploitation either in the pre-regime period or, subject to the rules and procedures that a regime would constitute, following the establishment of the regime. Also with regard to the last sentence of paragraph 2 of Article X, the 'without prejudice' clause would apply to exploitation whether by a State, government entity, non-governmental enterprise or international organization."

(2) There is no moratorium in the Treaty on exploitation of natural resources either pre-regime or if a state chooses not to become a party to the Treaty establishing such a regime. Proposals for such a moratorium were submitted for the record by India, Italy and other delegations. No such provisions appear anywhere in the Treaty and the United States through numerous statements in the record said it would not accept a moratorium.

(3) The Treaty does not apply to trajectories and orbits of space objects in earth orbit only or trajectories of space objects between the earth and earth orbit. 1979 COPUOS Report, par. 63, U.N. General Assembly Resolution A/Res/34/68. Committee reports which address particular questions of treaty interpretation, especially if adopted without question, would be legally conclusive with respect to the questions of interpretation they address.

(4) The United States can carry out exploitation of the natural resources of the Moon or other celestial bodies through the use of public or private entities.

The Soviet draft treaty and the 1972 U.N. Draft Treaty (Article VIII, par. 2, Commerce Committee Print, p. 11, Article X, par. 3, Commerce Committee Print, p. 20) could have been interpreted as preventing U.S. private entities or persons from carrying out activities on the Moon. This provision does not now appear in the Treaty. In addition the Treaty reported out of COPUOS contains an article (Article 14, par. 1) essentially the same as that contained in the 1967 Outer Space Treaty under which domestic communication satellite companies have been operating in space for many years.

As is recited in the history of negotiations in the Committee Print it was the USSR that blocked a consensus being reached during the years 1973 to 1979 based on their objection to the inclusion of the common heritage language in the Treaty. They finally did not block consensus when as a result of extensive informal discussions Article 11, paragraph 1, was amended by including the phrase "which finds its expression in the provision of this agreement."

The non-space powers on COPUOS, both developing and developed countries, viewed the Moon Treaty as another treaty between and for the sole benefit of the space powers. They argued they had received minimal benefit from the 1967 Treaty and no benefit from the 1968 Rescue and Return Agreement. They viewed the Liability Convention as not providing any space benefits to them but merely providing them compensation for injuries or damages they might suffer as a result of space activities by the space powers. Many of the countries represented on COPUOS were also members of Intelsat and viewed the Intelsat Agreement as the only space agreement providing a direct and tangible space benefit. They therefore viewed Article XI as the only article which at least provided an opportunity to the non-space powers to negotiate some "equitable sharing" arrangement when lunar or other celestial body resources proved commercially exploitable.

The United States for its part pressed hard for articles on mandatory reporting of activities; non-interference; consultation; and safeguarding, protecting and assisting all persons who might be on the moon or a celestial body, provisions the United States as a matter of course has and would follow in the absence of a Treaty, but which would be Treaty require the USSR also to follow. The United States also sought to assure that this Treaty did not prevent the start or continuation of national programs for the scientific and commercial exploration, use and exploitation of the Moon and other other celestial bodies.

A partial listing of these provisions is as follows:

The treaty lays down an obligation on parties to inform if they discover phenomena that could endanger human life or any indication or organic life.

It requires that all persons on CB's be accorded the special humanitarian treatment given astronauts under the 1968 Astronaut Rescue and Return Agreement (a potentially immense advantage)—regardless whether persons are on CB's for scientific or commercial reasons.

It calls for persons in distress to be offered shelterd and permits emergency use of facilities of other parties if necessary to save life.

The Treaty sets forth a duty to notify in the event of a crash landing.

It likewise imposes a duty to inform if mission locations of different countries may overlap.

The Treaty contains a number of requirements for advancing the fundamental principle of the 1967 Outer Space Treaty (Article I) of freedom and encouragement of scientific investigation. These requirements seek to further the widest possible scientific cooperation and to offer practical assistance in CB studies and activities.

Parties are required to notify of their activities on CB's, and their results, no later than mission completion, and, for long-duration missions, on a continuing basis every 30 days.

They are obliged to take measures to protect the balance of CB environments.

Parties are to report if they discover areas of special scientific interest, with the possibility of designating such areas as scientific preserves if agreed arrangements can be worked out.

They are to notify, in advance, of any intended use of radioactive materials on CB's.

They are to consider the desirability of exchanging personnel or expeditions to or in installations on the Moon.

The Treaty confirms the right to collect and remove samples for scientific investigation and to use CB substances to support scientific missions. Parties are encouraged to share samples among scientist of different countries, as has been the U.S. practice.

The Moon Treaty obliges parties to take measures to protect CB envirnoments (no wastage).

Requires meaningful consultations if another party's activities appear to jeapordize U.S. plans or activities.

In addition, Article 9, paragraph 1, provides that State Parties may establish manned or unmanned stations on the Moon, and in so establishing such stations a State Party shall use only that area which is required for the needs of the station; shall immediately inform the Secretary General of the United Nations of the location and purpose of that station; and at annual intervals States are required to inform the Secretary General whether the station continues in use and whether its purposes have changed. Under our system of government I have little doubt that U.S. activities whether carried out by the Government or private enterprise would be in compliance with this Article even in the absence of such treaty language. The USSR and other States who become Parties to the Treaty would be required to conform to this provision.

Also, Article 9, paragraph 1, taken in conjunction with Article 9, paragraph 2 (shall not impede free access to all areas of the Moon); Article 8, paragraphs 1, 2 and 3 (pursuit of activities anywhere on or below its surface; place facilities, stations and installations on or below the surface of the Moon; and States shall not interfere with the activities of other State Parties on the Moon); and Article 11, paragraphs 2 and 3 (no sovereignty, no ownership) if applied to a mining facility in effect establishes procedures which I believe parallel mining operations on public lands in the United States, that is, locating an area having potential mineral resources, staking out the claim, filing the location of the claim with a central office, and the requirement to work the claim or it is considered abandoned. The filing of the location of a claim does not transfer ownership of the public land to the claimant and similarly under the Moon Treaty the use and occupancy of an area of the Moon does not transfer ownership of that area of the Moon. The non-interference provision of the Treaty does in effect give the State Party or private enterprise party, acting under

authority of a State Party, the equivalent of an exclusive privilege to mine the claim. These Treaty provisions also limit the area that can be mined to that which is required to conduct the mining operation, thus preventing a single State from excluding others from areas it is not using for such operations. Thus the Moon Treaty does contribute to the continuing development of space law and does provide more certainty that currently exists under the 1967 Outer Space Treaty.

The Treaty also contains a review provision (Article 18) which can trigger an examination of the Treaty ten years after entry into force of the Treaty or by request of one-third of the State Parties to the agreement, with the concurrence of the majority of the State Parties, at any time after the Treaty has been in force for five years. If at any time after the Treaty has been in force for five years there is a clear indication of an unwillingness by U.S. private enterprise to invest in the exploitation of the lunar resources solely for the reason of the uncertainty as to what the future international regime will look like, a review conference could be requested to consider a revision or if appropriate the implementation of Article 11.

Finally, under Article 20 of the Treaty any State Party may give notice of its withdrawal one year after the Treaty enters in force with withdrawal taking place one year after such notice has been given.

I have tried in this statement to at least touch upon the events leading up to the introduction of the Moon and Celestial Bodies Treaty, the history of negotiations, and the interpretation of some of its provisions and where possible to avoid duplicating material already contained in the studies that were prepared at the request of the Committee, or addressed by other witnesses.

Thank you Mr. Chairman. This concludes my statement.

[The following information was subsequently received for the record:]

SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE,
August 12, 1980.

Mr. S. NEIL HOSENBALL,
General Council, National Aeronautics and Space Administration, Washington, D.C.

DEAR MR. HOSENBALL: At the hearing on July 29th, you emphasized that the interpretation of the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies" depended on the negotiating history as required by the Vienna Convention on the Law of Treaties and customary international law.

It has now come to the attention of the Subcommittee that the United States has not ratified the Vienna Convention, but that the United States has followed the principle that the interpretation of treaties depends on the negotiating history. Nevertheless, the absence of U.S. ratification of the Convention might be used as an argument against the position you have taken on the interpretation of the "Moon Treaty." The Committee would very much like to have your views on this matter which we propose to publish in the hearing record.

With every good wish.

Sincerely,

ADLAI E. STEVENSON, *Chairman.*

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,
Washington, D.C., September 5, 1980.

Hon. ADLAI E. STEVENSON,
Chairman, Subcommittee on Science, Technology, and Space, U.S. Senate, Washington, D.C.

DEAR SENATOR STEVENSON: In responding to the question raised in your letter of August 12, I believe it is generally accepted that Articles 31 and 32 of the Vienna Convention on the Law of Treaties (which entered into force January 27, 1980, and has been signed but not ratified by the U.S.) are codifications of long standing customary international law. These two articles, which deal with the interpretation of international treaties, set forth the following rules:

ARTICLE 31

"2. The context for the purpose of the interpretation of a treaty shall comprise, in addition to the text, including its preamble and annexes:

66-705 O - 80 - 5

(a) any agreement relating to the treaty which was made between all the parties in connection with the conclusion of the treaty;

* * * * * * *

"4. A special meaning shall be given to a term if it is established that the parties so intended."

ARTICLE 32

"Recourse may be had to supplementary means of interpretation, including the preparatory work of the treaty and the circumstances of its conclusion, in order to confirm the meaning resulting from the application of article 31, or to determine the meaning when the interpretation according to article 31:

(a) leaves the meaning ambiguous or obscure; * * *."

Under the above rules it is clear that the negotiating history, including statements on the record and agreements of the Committee set forth in its Report, can be relied upon in interpreting the meanings to be accorded to words and phrases of the Moon Treaty.

The interpretations on which I testified are based on the negotiating history of the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies," and I do not believe the lack of U.S. ratification of the Vienna Convention on the Law of Treaties would affect the testimony as given.

Sincerely,

S. NEIL HOSENBALL,
General Counsel.

CONSENSUS

Question 1. This agreement was under discussion in the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space earlier in 1979 without a consensus being reached. Why was the Full Committee able to reach agreement on July 3, 1979, when the same group of people in the Legal Subcommittee were unable to do so 3 or 4 months earlier in 1979?

Answer. At the 1979 Legal Subcommittee session it would appear that key delegations had specific instructions as to the parameters of what they could agree to. As a result of extensive discussions among delegates, the form of a treaty on which consensus might be reached emerged. However, certain delegations, i.e., the U.S.S.R. and the developing countries, apparently required further instructions from their governments before they could join in the consensus. At the full Committee meeting, some three months later, these delegations undoubtedly did have instructions which permitted them to join in the consensus on the basis of the text which emerged at the 1979 Legal Subcommittee session.

Question 2. What were the principal issues resolved in the meeting of the Committee on the Peaceful Uses of Outer Space that were unresovable earlier and brought about consensus?

Answer. The principal issues resolved were: (1) the formulation of the common heritage language which, upon the insistence of the U.S.S.R. restricted the interpretation of the concept to the provisions of the Moon Treaty upon which the U.S.S.R. insisted, (2) the acceptance by the developing countries of this formulation of the common heritage concept and (3) the developing countries agreement to forego a moratorium on the exploitation of natural resources pending the establishment of an international regime.

Question 3. To bring about the consensus on July 3, 1979, on the agreements, did the U.S. have to give in on any issue?

Answer. The U.S. did not have to give in on any issue to bring about the consensus on July 3, 1979.

Question 4. Did the United States play a leadership role in bringing about consensus on this agreement in the Committee on the Peaceful Uses of Outer Space and in the Legal Subcommittee?

Answer. The U.S. played a leadership role in regard to the Moon Treaty in the Legal Subcommittee in the early years, 1972 and 1973, when numerous U.S. proposals were introduced (see p. 25 of study prepared for the Committee by Eilene Galloway). However, the U.S. did not play a leadership role in bringing about consensus in the later years, from 1974 through 1979.

Question 5. Were there reasons for gaining consensus on July 3 that had to do with issues other than the Treaty?

Answer. The Committee membership had substantially increased, from 37 to 47, since consensus had been reached on the Registration Convention in 1974. Delega-

tions appeared to be distressed at the fact that the Moon Treaty had been on the agenda since 1972 and the new member states were raising questions about the viability of the consensus procedure. There was a growing momentum in the Committee to reach a conclusion of the Moon Treaty, particularly since it was the agenda item which seemed to be closest to a consensus, i.e., the issues separating delegations were capable of resolution.

Question 6. Was there concern that if the Committee on the Peaceful Uses of Outer Space did not come to a consensus on some of the major issues before it that the way in which the committee conducts its business might be changed? Did that issue have anything to do with bringing about the consensus on this agreement?

Answer. There was some concern, as stated above, on the viability of the consensus procedure, but it was not a major contributing factor in bringing about consensus on this agreement.

Question 7. What was the role of the U.S.S.R. in obtaining consensus?

Answer. By agreeing in 1979 to the inclusion of the common heritage concept as a result of negotiations between the U.S.S.R. and key developing countries, the U.S.S.R. carefully circumscribed the concept with specific language, and permitted the consensus to be developed.

Question 8. Did the Soviet Union join in consensus on the Treaty before or after the United States?

Answer. The U.S.S.R. and its eastern bloc allies were essentially the last member states to join in the consensus on the Treaty.

Question 9. What was the position of the U.S.S.R. on the principle the "Common Heritage of Mankind?" How does the U.S.S.R. interpret this phrase?

Answer. The U.S.S.R. argued from 1972 until 1979 against the inclusion of the common heritage principle on the basis that it could have no meaning since the world cannot inherit what is not owned by any entity. However, they finally did accept the carefully formulated common heritage language which ties interpretation of the concept to the provisions of the Treaty itself and in particular to the international regime to be negotiated in the future. They appear to feel that interpretation of the common heritage concept cannot be linked to precedents outside the Moon Treaty, such as the Law of the Sea.

Question 10. Did the Soviet Union have to give in on any issue to join the consensus?

Answer. To join the consensus, the U.S.S.R. had to give in on: (1) the scope of the Treaty to include celestial bodies other than the moon, (2) the provision of information as stated in Article V, paragraph 1, and Article VII, paragraph 2, and (3) agreeing to include a formulation of the common heritage principle.

Question 11. During the many years that the agreement was under consideration in the United Nations Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space, did our Government ever consult with the Congress or with interested parties outside the Government on the agreement?

Answer. To my knowledge, discussions on the Moon Treaty did take place with Congressional staff personnel while it was under consideration in the U.N. Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space beginning in the spring of 1978. The chronology of these contacts with the Congress on the Moon Treaty can best be answered by the Department of State. I have no personal knowledge of consultations with interested parties outside the Government, but it is possible that there were such consultations.

Question 12. Many who are knowledgeable and watch closely the activities of this U.N. committee were surprised that consensus was reached on this agreement in July of 1979.

Answer. I am surprised that "many who are knowledgeable and watch closely the activities of this U.N. Committee were surprised that consensus was reached on this Agreement in July of 1979." The Legal Subcommittee has had this agreement on its agenda since 1972. Most of the work on it occurred in the 1972 and 1973 time frame. Those closely watching the Committee must have been aware of the introduction of the so-called Austrian clean text in 1977 and the extensive discussions on that text in 1978, with the indication of possible movement by the U.S.S.R. on the contentious issue of common heritage. This movement by the U.S.S.R. was correctly interpreted by the U.S. as presaging a possible breakthrough on the Agreement and was communicated to the Congress through consultations in 1978 and 1979. Those who closely watch the Committee cannot have failed to see that there was a major effort to resolve the outstanding issues beginning in 1977 and that the movement toward consensus was gaining momentum.

Question 13. Has it ever happened before on any major issue that the Committee on the Peaceful Uses of Outer Space was able to reach consensus when one of its subcommittees was unable to reach consensus?

Answer. A review of the "Hearings before the Committee on Foreign Relations, United States Senate, Ninetieth Congress, First Session on executive D, 90th Congress, First Session, March 7, 13, and April 12, 1967" on the Treaty on Outer Space establishes that consensus on the 1967 Outer Space Treaty was not reached during the formal sessions of the Legal Subcommittee which were held in the summer and fall of 1966. Agreement on the 1967 Outer Space Treaty was reached as a result of detailed private consultations among members of the Outer Space Committee in New York during the fall of 1966 and the Treaty was then presented to the U.N. General Assembly. The General Assembly adopted this resolution by acclamation on December 19, 1966, and on January 27, 1967, the 1967 Outer Space Treaty was opened for signature simultaneously in Washington, London and Moscow.

REPORTING AND INFORMATION

Question. Throughout the agreement in various places states parties to the agreement are required to imform, notify, or report to the Secretary General of various events. In a few instances they must also inform or report to other states parties, but in Article 5, paragraphs 1 and 3, and in Article 11, paragraph 6, states parties are required to inform the Secretary General* * * as well as the public and the international scientific community to the greatest extent feasible and practicable. Why is the international scientific community singled out in these two articles? Why not the international technical community of the international legal community, or some other international community? Why not inform the public as well as the Secretary General in all cases?

States parties are not required to report to the international scientific community concerning areas of the Moon having special scientific interests in order that consideration may be given to the designation of such areas as international scientific preserves (Article 7, paragraph 3). Yet this would seem to be the one instance in the agreement where the international scientific community ought to be informed so it can pass judgment on any special protective arrangement to be agreed upon in concultation with the competent bodies of the United Nations. What is your view?

Answer. The provisions in the Moon Treaty requiring States Parties to the Agreement to inform the Secretary General as well as the public and international scientific community are taken from Article XI of the 1967 Outer Space Treaty. It is assumed that in all instances the Secretary General would disseminate any information received to all interested groups and in particular to those having a recognized special interest. Singling out the international scientific community as opposed to other communities was based on the belief that this community, in particular, had a recognized special interest and expertise.

Article 7, paragraph 3, does nothing more than to establish a mechanism for the establishment, if such is deemed desired, of protective arrangements of areas which may be of special scientific interest. It is my view that the judgments that would have to be made to establish international scientific preserves, could not be made without the participation of the international scientific community.

ARTICLE 12

Question. Article 12, paragraph 3, is worrisome. It says, "In the event of an emergency involving a threat to human life, States Parties may use the equipment, vehicles, installations, facilities or supplies of other States Parties on the Moon. Prompt notification of such use shall be made to the Secretary General of the United Nations or the State Party concerned."

Does this mean that in an emergency a State Party can use the equipment, vehicles, installations, facilities, or supplies of another State Party on the Moon without first giving notification and getting permission of the State Party to whom the equipment, vehicles, installations, facilities or supplies belong?

Answer. Article 12, paragraph 3, does mean that in an "emergency involving a threat to human life" a State Party may use the equipment, vehicles, installations, facilities, or supplies of another State party on the Moon without first notifying and getting permission of that other State Party. However, prompt notification of such use to the Secretary-General or to that other State Party is required. It should be noted that this right of use without first notifying the State Party concerned only exists in an emergency situation which involves a threat to human life. As such, it must be characterized as a legitimate response to a humanitarian need for help to preserve human life in what is generally a hostile environment. It would be unrealistic, and defeating the purpose of this provision, to require the giving of prior notice to or getting permission of, the State Party to whom the equipment, vehicles, installations, facilities or supplies belong.

SPACE SCIENCE AND APPLICATIONS

Question. Is there any way in which the provisions of the Celestial Body Agreement might hinder the progress of space science and applications?

Answer. Quite the contrary, the Celestial Body Agreement explicitly authorizes the carrying out of scientific investigations in Article 6, clarifies the right of ownership of natural resources that have been removed in Article 11, paragraph 3, sets forth the right of States Parties to pursue activities of exploration and use of celestial bodies in Article 8, paragraphs 1 and 3, ensures non-interference with the activities of States Parties in Article 8, paragraph 3, and authorizes the establishment of stations on celestial bodies in Article 9, paragraph 1. It has been argued that commercial exploitation of space activities, and in particular the exploitation of mineral resources on celestial bodies might, in the absence of a defined international regime, be inhibited because of return of investment considerations.

COPUOS UNDERSTANDING

Question. Before reaching consensus on the Agreement, the Committee on the Peaceful Uses of Outer Space made a decision to clarify certain parts of the Agreement by stating certain understandings in its report. There are three understandings to be found in paragraphs 62, 63 and 65 of the Committee's report. It is noted that the resolution adopted by the General Assembly endorsing the treaty called attention to these three paragraphs. What is the legal status of these three understandings?

Answer. This question was I believe fully answered in my statement for the record and is also being responded to by the Department of State.

SOLAR POWER SATELLITES

Question. This agreement relates to the Moon and other celestial bodies within the solar system other than the Earth; therefore, it must relate to the Sun. Would it have any application to a solar power satellite?

Answer. The Agreement would not apply to a solar power satellite in Earth orbit because the Agreement does not apply "to trajectories and orbits of space objects in Earth orbits only and trajectories of space objects between the Earth and such orbits" (see the 1979 Report of the Committee on Peaceful Uses of Outer Space, A/34/20, paragraph 63). Further, the non-ownership of celestial bodies natural resources provision in Article 11, paragraph 3, of the Agreement applies only to such natural resources "in place." The Sun's rays are not natural resources of the Sun in place on the Sun.

TREATY INTERPRETATION

Question. It is often argued that the meaning of certain words and phrases in the Agreement will be set by precedent, earlier debate and analysis and that the Agreement must rely on already established meanings. Would you please give the Subcommittee your views on this issue?

Answer. I believe the accepted rules of treaty interpretation are reflected in Articles 31 and 32 of the Vienna Convention on the Law of Treaties. A treaty is normally interpreted in accordance with the ordinary meaning of its terms in their context and in the light of the treaty's object and purpose, and a special meaning is to be given to a term if it is established that this was the intent of the parties. It was to avoid "common heritage" being defined in some other context and to establish that it was to be given a special meaning in the Moon Treaty that the words "which finds its expression in the provisions of this agreement" was inserted into Article 11, paragraph 1.

INTERNATIONAL REGIME

Question. Mr. Owen said any "international regime" negotiated pursuant to Articles 11 and 18 would be submitted to the Senate for advice and consent. However, the Agreement does not provide for the submission of an international regime agreement to those States that are a party to the Celestial Bodies Agreement. What are your views on this issue? How could the Senate be assured that any future agreement dealing with the international regime will be submitted to the senate for advice and consent to ratification?

Answer. I fully concur in the answer provided by the Department of State.

Question. Is it legally certain under the terms of the Agreement that the Agreement does not apply to space activities in Earth orbit other than space activities on the Moon or around the Moon?

Answer. In accordance with customary international law, as codified in Article 31 and 32 of the Vienna Convention on the Law of Treaties, paragraph 63 of the 1979

report of the Committee on the Peaceful Uses of Outer Space clearly sets forth the agreement made between all the parties in connection with the conclusion of the Moon Treaty as to the scope of application of the Treaty: to wit, it does not apply to space objects in Earth orbit only. Since space activities in Earth orbit are usually connected with space objects, not celestial bodies, it follows that space activities in Earth orbit only are not governed by the provisions of the Moon Treaty.

Question. Would you please explain what in COPUOS is meant by the term "International Regime?"

Answer. "International Regime" was not given a definition as such by the COPUOS. Rather the Committee in Article 11, paragraph 7, set forth the main purposes of the international regime to be established in the future through negotiation. The committee did not set forth in the Treaty nor in the negotiating history what form such a regime should take. What it is to be, its form, its procedures are to be decided at some future time. In French law, it means a system of rules or regulations (Black's Law Dictionary, Fifth Edition (1979)), but it may also be more generally defined so as to also include organizational arrangements.

ENVIRONMENT

Question. Article 7 deals with the environment of celestial objects and says that State Parties shall take measures ot prevent the destruction of the existing balance of the environment of celestial bodies by preventing its harmful contamination. How would you define the environment of a celestial body? What is meant by harmful contamination of a celestial body?

If you land a spacecraft on a celestial body, you introduce to that celestial body "extra-environmental matter," which, depending on your view, could be harmful or non-harmful to its environment.

Mining of an asteroid with a 1 kilometer diameter would change its environment—is that forbidden by the Agreement?

It appears that Article 7 as it deals with the celestial body environment carries over many of the environmental attitudes and ideas being applied to the planet Earth which is drastically different than any other celestial body in the Solar System (e.g., it supports life).

In the future man may want to change the environment of a celestial body (e.g., the atmosphere of Venus). Why should there be a treaty now which deals with celestial body environment?

Answer. Article VII, paragraph 1, is a restatement and extension of Article IX of the 1967 Outer Space Treaty which provides "States Parties to the Treaty shall pursue studies of outer space, including the moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter, and when necessary, shall adopt appropriate measures for this purpose."

Article VII, paragraph 1, of the Moon Treaty extends Article IX of the 1967 Outer Space Treaty by providing the same protection afforded to Earth by the 1967 Outer Space Treaty to Celestial Bodies, i.e., States shall take measures to prevent adverse changes in the environment of Celestial bodies.

I have not researched the negotiating history of the 1967 Treaty or of the Moon Treaty for specific references to these articles. However, I beleive in using the term environment in Article VII of the Moon Treaty and in Article IX of the 1967 Outer Space Treaty the intent of both Articles is that States should conduct their activities in exploring and using the moon and other celestial bodies in such ways as will not be adverse or harmful to the scientific exploration of celestial bodies and ultimately the use and exploitation by States of celestial bodies. Also such activities shall not be adverse or harmful to conditions existing on the Earth.

As indicated the 1967 Space Treaty required exploration of celestial bodies be conducted so as to avoid their "harmful contamination." Unmanned spacecraft of the U.S. and U.S.S.R. had landed or orbited the moon and other planets prior to and since the 1967 Treaty and manned U.S. exploration of the moon had taken place prior to the Moon Treaty, it being universally recognized that space exploration would require the use of spacecraft. The United States has taken measures to minimize the possibility of harmful contamination.

Nothing in the Agreement would forbid the mining of an asteroid. If measures were taken during the mining operation not to disrupt the existing balance of conditions in space surrounding the asteroid or affect the environment of Earth, the use of the entire asteroid would be consistent with the purpose of the Moon Treaty as expressed in its Preamble "Bearing in mind the benefits which may be derived from the exploitation of the natural resources of the moon and other celestial

bodies" as well as other Articles in the Treaty and the agreed interpretation of Article VII included in the report of the Committee.

The purpose of Article VII is to minimize the possibility of carrying out activities which will interfere with the current scientific objectives of planetary exploration. The major objectives of planetary exploration at this time and for some time in the future are to further our understanding of the origin and evaluation of the solar system; to further our understanding of the origin and evolution of life; and to further our understanding of Earth by comparative studies of the moon and other planets. At some time in the future it may very well be that man may want to change the environment of a celestial body so as to make exploitation less hostile to man's use of the celestial body. It is not the intent of the environment provisions to prevent changes to the environment that will further man's use and exploitation of celestial bodies.

SPACE OBJECTS

Question. The Agreement does not apply to trajectories and orbits of "space objects" in Earth orbit only, except the Moon. Is that a correct interpretation of this Agreement?

What is a space object? Space vehicle? Man made space object? Spacecraft? Object?

If a near-Earth asteroid were moved into an orbit about the Earth for exploitation, would it become a "space object" under the terms of the Agreement and therefore not subject to the terms of the Agreement?

In this respect the Agreement appears contradictory: The Agreement applies to celestial bodies but not to space objects in Earth orbit.

Answer. In accordance with the agreement as to interpretation reached by the Committee in paragraph 63 of its 1979 Report, the Agreement does not apply to trajectories and orbits of space objects in earth orbits only. Under customary international law, as codified in Articles 31 and 32 of Vienna Convention on the Law of Treaties, this is the correct interpretation of the scope of application of the Agreement concerning trajectories and orbits.

"Space Object" has been defined in the Liability Convention and Registration Convention as including "component parts of a space object as well as its launch vehicle and parts thereof." The term "object" is used in the 1967 Outer Space Treaty. The term man-made space object only appears in Article III. The use of these terms is intended to cover all objects launched into space from earth or objects that are constructed by a State in space or on celestial bodies as opposed to celestial bodies themselves. Space vehicles and spacecraft are included in the term "space object" but were used in the Moon Treaty because spacecraft is also used in the Rescue and Return Agreement. "Space Vehicle" was used not only to describe a launch vehicle but other modes of transportation that might be used on a celestial body or travel in space.

It is my view that a near-earth asteroid moved into orbit about the Earth is a celestial body within the meaning of that term, and would not change its character by moving into orbit around the Earth.

Based upon the foregoing views the Agreement is not contradictory.

Senator STEVENSON. Thank you.

Our next witness is Ronald F. Stowe, chairman of the Aerospace Law Committee of Section on International Law.

STATEMENT OF RONALD F. STOWE, CHAIRMAN, AEROSPACE LAW COMMITTEE OF SECTION ON INTERNATIONAL LAW, AMERICAN BAR ASSOCIATION

Mr. STOWE. I am speaking this morning in my personal capacity. The policy of ABA is to refrain from public advocacy of committee positions until the full house of delegates has reviewed and approved them. That has not yet happened with regard to the reports and recommendations on the Moon Treaty.

The issue I would like to address is whether it is in the national interest of the United States to sign and ratify the Moon Treaty. To answer that question, I believe it is first essential to define that national interest or perhaps, as Senator Schmitt referred to it, our

national space policy, and then to measure the provisions of the treaty against that definition.

The principal area in which the treaty has generated controversy relates, in my view, to the question of potential international control over national activities in outer space. In that context, I believe that our national interest calls for maximum flexibility in the right and opportunity to conduct lunar resource exploitation, for national discretion to decide how and to what extent the benefits of our activities will be shared, and for sufficient legal and political predictability so that potential investors in both the private and public sector will have a reasonable basis for their decisions.

It is my view that nothing in this treaty is inconsistent with those U.S. interests, and that nothing in this treaty jeopardizes our ability to protect those interests. The objections I have heard to this treaty are, I believe, based on a series of worst case assumptions about what a future, separately negotiated, separately approved resource exploitation regime might say.

That future regime is obviously going to be based on a number of principles contained in this treaty. A number of those principles are sufficiently general that they would permit different interpretations by different parties. This is the result of years of negotiation among nations which have different points of view, and the fact that we did not obtain explicit confirmation of our own views to the exclusion of all others should not come as any surprise.

I would suggest that each of the relevant guidelines and principles contained in the treaty is consistent with the practices and policies of the U.S. space program, and, where they are generalized or ambiguous, that they are as susceptible to reasonable interpretation in our favor as in favor of any point of view.

For example, the four principal elements that are to be reflected in the international regime contained in this present treaty are, first, the orderly and safe development of national resources of the Moon—surely not an inflammatory principle.

The second is the rational management of the lunar resources of the Moon. It takes some stretching to say that is contrary to the U.S. national interest.

Third is the expansion of opportunities in the use of those resources. I would suggest nobody really knows what that means. In any event, it clearly does not compel the United States to give up technology or benefits or resources.

And the fourth purpose of the regime would be to provide an equitable sharing by all states' parties in the benefits derived from the resources.

I would suggest as a matter of general principle the United States has been observing that purpose, and has been mandated by the U.S. Congress to observe that same goal since the 1958 National Aeronautics and Space Act, which states that the U.S. activities in space should be devoted to peaceful purposes for the benefit of all mankind.

I do not believe that any of these general purposes for the international regime are in the least bit, by themselves, offensive to U.S. interests, either now or in the future. I suggest rather that a hard-nosed, skeptical, self-interested analysis leads to the conclusion that ratification of the treaty subject to the inclusion in our

instrument of ratification of certain specific national interpretations of key issues would put the United States in a far stronger position to protect our interests, both legally and politically, than would refusal to ratify.

The inclusion of interpretations in our instrument of ratification would legally define the scope of the obligations which we have assumed, and no other country would have a defensible claim that we are bound by any other interpretation.

For example, if the United States asserts in its instrument of ratification that it reserves to itself the right to decide how and to what extent it will share the benefits it derives from lunar resources, no other state has any case at all that it or any group of states has the right to compel such sharing.

If the United States declares in its instrument of ratification that for the purposes of this treaty it accepts only a specified interpretation of the term "common heritage of mankind," then no other state has any case at all that the United States has accepted more, whether we have agreed to something else in the Law of the Sea context or not.

It should come as no surprise that countries with a present or anticipated ability to engage in lunar resource exploitation will seek maximum flexibility to do so. That is what we are doing. That is exactly what we should do.

It should also come as no surprise, however, that countries without that ability will seek to get a free cut of the action. That is what they are doing. This is not new. We have to deal with variations of it daily, both domestically and internationally. We can count on it being significant as a factor in the resource regime negotiations whether or not the United States ratifies this treaty.

We have stood alone before and may stand alone again. That is not the important issue. The important issue is how we can best protect ourselves. I would suggest that in this case, at least, standing alone through abstention adds nothing, whereas standing alone, should that prove necessary, through strongly asserting our national policies and positions, would add a great deal.

I find a curious irony in the recommendation by some that the best way to protect our national interest is not only to refuse to play the game, but also to refuse to try to shape the rules.

Why refuse to shape the rules? Because we anticipate the majority will not agree with us? That recommendation appears to presume and project a national impotence, lack of will, absence of strength of our convictions and inability or unwillingness to protect ourselves.

Proponents of nonratification appear to justify their recommendation principally with the argument that, in their view, the United States has been taken to the cleaners in the Law of the Sea negotiations, and we should therefore refuse to participate in any comparable exercises.

In my view, that suggests an unacceptable futility and self-fulfilling anticipation of defeat. In addition, I would suggest that proposals to renegotiate the treaty or to negotiate a protocol now with elaborated definitions are, as a practical matter, designed to defeat ratification of the treaty, not obtain a more favorable result for the United States.

It is hardly realistic to expect other countries, while the Law of the Sea negotiations are going on or soon after their conclusion, to be willing to endorse implementation criteria or procedures which are different from those they have fought so hard to gain in the Law of the Sea context.

That is absolutely not to say that those countries will refuse to agree to different procedures in the outer space context later when the treaty calls for regime negotiations to be held. In fact, I believe that a very different approach eventually will be adopted.

It is, however, to recognize an element of truth about human and national psychology, a factor we ought to take into consideration.

In the event we are unable to obtain an acceptable outcome from the resource regime negotiations, the United States must be determined enough and independent enough to refuse to become a party to that regime. But we can make that decision later. There is no advantage or justification for making it now. It is not the present treaty which threatens our interests, but the worst case potential of a future one.

I believe we can and must have sufficient national good sense and willpower to be one of the cooks without feeling compelled to eat everything that comes out of the kitchen. If we are not one of the cooks, if we do not ratify this treaty, the meal is virtually certain to be indigestible. If we are, we are certain to be a major force in the kitchen and chances for an edible, if not gourmet, result will be vastly enhanced.

The ingredients in this treaty, seasoned by the interpretation and declarations suggested in the paper I submitted, are reasonable and sound. We should try to turn them into universally acceptable fare.

We have all heard the current rash of horror stories about the consequences of ratification. For example, we have heard that under this treaty the United States will have to give away its advanced technology to all comers. We have heard the international community can seize the benefits of U.S. efforts in lunar research exploitation. Even though negotiators rejected it and the treaty does not mention it, we have heard that there is somehow created a moratorium on such exploitation.

We have heard that foreign countries could, at their whim, send storm troopers marching through our space facilities; that encroachment on space operation is permitted, if not encouraged, that the treaty would bind and constrain the United States but not other states parties and a variety of other such improbables.

I believe these stories are not based on what the treaty says, but are principally the products of excited imaginations combined with generalized frustration with the current ineffectiveness of the United States in foreign affairs. This combination appears to lead to a blanket presumption that we have been had, regardless of what the treaty actually says. That frustration may be understandable, but it is hardly a promising or adequate foundation on which to build our inescapable future role in the international community.

With regard to the question of investment security, I believe that the United States should couple ratification of this treaty with strong congressional and executive branch support for both private

and public sector efforts to tap the potential benefits of the industrialization of space. That support should come in the near future through legislative and administrative action to establish at least minimum guarantees against future U.S. agreement to international rules which could undermine existing U.S. investments in lunar resource exploitation. There are many ways in which this could be done, and they need to be explored.

That support should not and could not come through refusal to ratify the present treaty. In my view it should not, because the present treaty does not create any threat to such future investments. It could not, because whatever investment insecurity exists arises from the fact that the resource regime negotiations will be held; it does not arise from a decision by the United States whether or not to ratify this treaty. Failure to ratify would not dispel investment insecurity. It would simply make it more difficult for the United States to protect its own interests.

The regime negotiations are virtually certain to be held, and I believe we would be wise to put ourselves in the best possible position to effect a positive outcome.

The first step toward that position, in my view, would be ratification of the treaty, subject to our interpretation of key provisions.

Thank you.

Senator STEVENSON. Do I understand correctly that the only way the United States participates in the conference on the international regime is by the ratifying treaty?

Mr. STOWE. The treaty says there will be a review conference of state parties. If we are not a state party, then in the first instance, I presume we would be able to participate only as some sort of observer. That is hardly designed to give us maximum influence. If we, as a practical matter, somehow manage to wield enough political clout to get the ground rules changed and were admitted to the regime negotiations as a full participating member, we would have to bargain something away for that opportunity. I think there is no reason for us to give up that sort of leverage in light of what the treaty says.

Senator STEVENSON. Are we assured that any agreement establishing an international regime would come to the Senate for its ratification?

Mr. STOWE. I do not think there is any question about that. I think the Senate could make sure of that.

Senator SCHMITT. Somebody claimed the SALT II Treaty didn't have to be submitted to the Senate but was only done so as a courtesy to the Senate.

Mr. STOWE. I think the Senate has enough influence, particularly with an administration as reticent to submit a new international treaty as this one is, that you should not have much trouble making sure it got up here. There is no question in my mind that a separate international agreement is required for the result of the regime negotiations. If that is a separate international commitment from the United States, I think the Constitution clearly requires it come to the Senate.

Senator SCHMITT. If the Chairman would yield, NASA has plenty of cooperative agreements with other nations that have not been submitted to the Senate for ratification, and with groups——

Mr. STOWE. I am aware of that. Yet, I think it is clear the way this future regime would be set up under a multilateral treaty negotiated within the context of the United Nations that it is very different from the ground rules, which, in fact, I believe Congress authorized, permitting NASA to conclude a variety of implementing agreements with other countries in pursuit of its civilian space program. Those NASA agreements, to my knowledge, are consistent with direction of the Congress and practice of the Congress.

I do not think this kind of regime negotiation would be simply considered a subset of the existing authority of NASA.

Senator SCHMITT. The analogy being the Intelsat situation.

Mr. STOWE. That is one analogy, certainly. And after all, it would be rather easy for the Senate, in giving its advice to the administration on ratification of the present treaty, to specify its understanding that the administration will submit any result of a future resources regime negotiation to the Senate for its ratification.

Senator SCHMITT. Thank you.

Senator STEVENSON. Thank you.

Senator SCHMITT. Let me just pursue this. Do you see anything in general that is inconsistent between the model Intelsat uses and what that regime might turn out to be? I use the word "model" now emphasizing it. We obviously have two different activities.

Mr. STOWE. I see nothing in the treaty that would rule out the type of arrangement that Intelsat adopted.

Senator SCHMITT. A user-based investment arrangement.

Mr. STOWE. Yes. Your share in the profits is related to use of the system and capital investment. There is nothing here inconsistent with that, that I see. I do not see that as inevitable. We might find ways more desirable. I do not find the Intelsat example exactly analogous, because Intelsat links a lot of countries, all of which are using communications. We may want to set up something that, in fact, is more limited—that has less of an independent organization itself, but rather is a series of specific ground rules.

Senator SCHMITT. The alternative is a series of specific Intelsat-type organizations that are bounded by common interest in a particular use of technology or a particular resource. You indicate in your testimony that one way to diffuse some of the objections of the treaty would be to simultaneously establish strong support for the industrialization of the resources of space. That has been fairly difficult to get out of this administration or any previous administration.

Would you anticipate the atmosphere for that changing? It's a good idea. If it were not possible, would that change your attitude toward the treaty at all?

Mr. STOWE. It would not change my recommendation that the treaty be ratified with a number of interpretations by the United States. I think it's terribly important, in order to maintain our future ability to influence that regime, that we do ratify this treaty. I think it is desirable, in addition, to have that statement of support. I believe it is possible for the Congress, as well as the administration, to take a leadership role in that kind of pronouncement, if the Congress wished to do so. I think it is important to emphasize that investment insecurity will not be either enhanced or dispelled by ratification by the United States of this treaty. In

my view, that insecurity, insofar as it exists, is going to be there because companies know that in the future, perhaps 5 to 30 years in the future, there is a high probability that a resources regime will be negotiated.

In my view, if the United States is a party to this treaty, there is a greater chance that the outcome of those negotiations will be favorable to us than if the United States is not a party.

Senator SCHMITT. I tend to agree with you on that and other issues where we removed ourselves from the international scene. Like the proliferation issues, and so forth. We would make a major mistake in getting out of the kitchen. I had noticed the administration and to some degree Congress, using the lack of a regime or that type of agreement as being an excuse to restrict commercial activity or restrict industrial development of industrial capabilities in space.

It cuts both ways. Even though you sign the treaty, then the next thing is to negotiate a regime. Since you haven't negotiated it, why put any effort into these areas? People think that way, unfortunately.

Thank you, Mr. Chairman.

Senator STEVENSON. Thank you, Mr. Stowe.

[The statement follows:]

STATEMENT OF RONALD F. STOWE, CHAIRMAN LAW COMMITTEE OF SECTION ON INTERNATIONAL LAW, AMERICAN BAR ASSOCIATION

Mr. Chairman, before I comment on the treaty I would like to clarify that I am speaking this morning in my personal capacity. Although I am Chairman of the ABA Committee on Aerospace Law of the Section on International Law, the practice of the ABA is to refrain from public advocacy of an individual Committee or Section's views until the full House of Delegates has reviewed them. That has not yet occurred with regard to the pending reports concerning ratification of the Moon Treaty. In addition, I wish to clarify that the views I will express are not necessarily those of my employer, which has not considered or taken a position with regard to ratification of this treaty.

The issue I wish to address is whether it is in the national interest of the United States to sign and ratify the recently negotiated "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies." To answer that question it is first essential to define that national interest, and then to measure the provision of the treaty against that definition.

The principal area in which the treaty has generated controversy relates to the potential for international control over national activities in space, particularly with regard to the exploitation of natural resources. In this context, I would suggest that our national interest calls for maximum flexibility in the right and opportunity to conduct lunar resource exploitation, for national discretion to decide how and to what extent to share the rewards and benefits of our efforts, and for sufficient legal and political predictability so that potential investors, in both the public and private sectors, will have a reasonable basis for their decisions.

I believe that the provisions of this treaty are consistent with those United States interests, that nothing in this treaty jeopardizes our ability to protect those interests, and that the objections which have been raised to ratification are principally not based on what this treaty says, but rather are based on a series of worst-case assumptions about what a future, separately negotiated, separately approved, resource exploitation regime might say.

That future regime will be based on several of the provisions of this treaty, a number of which are sufficiently general to permit interpretation in different ways by different parties. This is obviously the result of years of difficult negotiations among nations which have different self-interests to protect, and the fact that we did not attain explicit confirmation of our views to the exclusion of all others should come as no surprise. I would suggest that each of the relevant guidelines and principles contained in this treaty is consistent with the policies and practice of the United States in our space programs and, where those guidelines are generalized or

even ambiguous, that each of them is every bit as susceptible to reasonable interpretation in our favor as it is in any other point of view.

I do not agree with those who argue that ratification of this treaty would threaten our interests now or in the future; on the contrary, I believe that a hard-nosed, skeptical, self-interested analysis leads to the conclusion that ratification of this treaty, subject to the inclusion in our instrument of ratification of certain specific interpretations and declarations would put the United States in a far stronger position to protect our interests, both legally and politically, than would refusal to ratify. (For a recommended list of such interpretations and declarations, please see Attachment A.) I do not subscribe to the theory that ratification would lead inevitably to a Law of the Sea regime in outer space; nor do I subscribe to the theory that refusal to ratify would serve as an effective deterrent to development of a future resources regime which would be inimical to our interests.

Quite to the contrary. Under accepted principles of international law, the inclusion of interpretations in our instrument of ratification would legally define the scope of the obligations we have assumed, and no other country would have a defensible claim that we are bound by any other interpretation. For example, if the United States asserts in its instrument of ratification that it reserves to itself the right to decide how and to what extent it will share the benefits it derives from lunar resources, no other state has any case at all that it or any group of states has the right to compel such sharing. If the United States declares in its instrument of ratification that, for the purposes of this treaty, it accepts only a specified interpretation of the term "common heritage of mankind," then no other state has any case at all that the United States has accepted more, whether we have agreed to something else in the Law of the Sea context or not.

Such interpretations and declarations in our instrument of ratification do not constitute mere press releases; they constitute an effective legal definition of the obligations we have assumed. (See Attachment B.)

It has been asserted that, as a practical matter, none of this would make any difference because a majority of countries will presumably disagree with our interpretations. I would suggest that it does matter very much, particularly because of that presumed majority view.

It should come as no surprise that countries with the present or anticipated ability to engage in lunar resource exploitation will seek maximum flexibility to do so, and that countries without that ability will seek to get a free cut of the action. That is not a new phenomenon; we have to deal with variations of a daily, domestically as well as internationally. Furthermore, it will be a significant factor in the resources regime negotiations whether or not the United States ratifies this treaty.

We have stood alone before, and we may stand alone again; that is not the important issue. The important issue is how can we best protect ourselves. I would suggest that, in this case, standing alone through abstention adds nothing, whereas standing alone, should that prove necessary, through strongly asserting our national policies and positions, would add a great deal.

There appears to be a curious irony in the recommendation by some that the best way to protect our national interests is not only to refuse to play the game but also to refuse to try to shape the rules. Why should we refuse to try to shape the rules? Because we anticipate that a majority will not agree with us? That would hardly constitute an assetive—or productive—national stance. In fact, such a recommendation appears to presume, and to project, a national impotence, a lack of will, an absence of strength of our convictions, and an inability or unwillingness to protect ourselves. It presumes both that we are incapable of negotiating a regime which will protect our interests, and that we would be helpless in face of an unfavorable outcome.

Proponents of non-ratification justify their recommendation principally with the argument that, in their views, the United States has been taken to the cleaners in the Law of the Sea negotiations and that we should therefore refuse to participate in any comparable exercises. In my view, that suggests an unacceptable futility and a self-fulfilling anticipation of defeat. It is, in short, the easy way out. It might make us feel good for a few days or even months—you aren't going to have the United States to kick around anymore—but it would attack the wrong target, would result in no practical benefit to the United States, and would simply undermine our ability to deal with the real challenge, which is how to ensure that the principles in this treaty are implemented in an acceptable manner in the future regime negotiations.

In addition, in my view, proposals that the United States should request either renegotiation of the treaty or negotiation of a protocol with elaborated definitions are, as a practical matter, simply designed to defeat ratification of this treaty, not to obtain a more favorable result for the United States. It would hardly seem realistic to expect other countries, while the Law of the Sea negotiations are going on or

soon after their conclusion, to be willing to endorse implementation criteria and procedures different from those they have fought so hard to gain in that context. That is absolutely not to say that those countries will refuse to agree to different procedures in the outer space context later, when this treaty calls for the regime negotiations to be held; in fact, I believe that a very different approach will eventually be adopted. It is, however, to recognize an elemental truth about human and national psychology, a factor which we obviously must take into consideration.

If we are to be effective in protecting our own national interests, the United States must first of all be prepared to work vigorously for an acceptable outcome to the regime negotiations. Those negotiations will be held whether or not the United States ratifies this treaty, and if it does not, this country may well be entitled to participate only in some sort of observer capacity. In any case, others would clearly have little incentive to make compromises with us, for we would not have not even accepted the last, and largely unobjectionable, treaty we negotiated with them. That is not likely to result in maximum influence for the United States.

In the event we are unable to obtain an acceptable outcome from the regime negotiations, the United States must be determined enough and independent enough to refuse to become a party to that regime. But we can make that decision later; there is no advantage or justification for making it now. It is not the present treaty which threatens our interests; it is the worst-case potential of a future one. Advocates of non-ratification of the present treaty are, in a large part, presuming not only that we will lose in those future negotiations, but also that we will be incapable of refusing to adhere to the results, no matter what they are. They are suggesting, in essence, that we primarily have to protect ourselves against ourselves—not just against others.

I believe that we can and that we must have sufficient national good sense and willpower to be one of the cooks without feeling compelled to eat everything that comes out of the kitchen. If we are not one of the cooks, if we do not ratify this treaty, the meal is virtually certain to be indigestible. If we are, we are virtually certain to be a major force in the kitchen, and the chances for an edible if not gourmet result will be vastly enhanced. The ingredients in this treaty, conditioned by the interpretations and declarations suggested in Attachment A, are now both reasonable and sound. It will do us no good at all refuse to try to turn them into universally acceptable fare.

I believe that the current rash of horror stories, for example, that under this treaty the United States would have to give away its advanced technology to all comers, that the international community could seize the benefits of U.S. efforts at lunar resource exploitation, that even though the negotiators rejected it and the treaty does not mention it there is somehow created a moratorium on such exploitation anyhow, that foreign countries could at their own whim send storm troopers marching through our space facilities, that encroachment on lunar resource operations is permitted if not encouraged, that adherence to the treaty would bind us but not other States. Parties, and a variety of other such improbables, are principally the products of excited imaginations combined with a generalized frustration with the current effectiveness of the United States in foreign affairs. This combination appears to lead to a blanket presumption that we have been had, regardless of what the text of the treaty actually says. The frustration may be understandable, but it is hardly a promising or an adequate foundation on which to build our inescapable, future role in the international community.

I believe that we can significantly enhance our ability to protect our national interests in the future by ratifying this treaty subject to our interpretation of key provisions, and by giving strong Congressional and Executive branch support to both public and private sector efforts to tap the potential benefits of the industrialization of outer space.

That support should come, in the near future, through legislative and administrative action to establish at least minimum guarantees against future United States agreement to international rules which could undermine existing U.S. investments in lunar resource exploitation. There are many ways in which this could be done, and they need to be explored.

That support should not, and in fact could not, come through refusal to ratify the present treaty. In my view it should not, because the present treaty does not itself create any threat to such future investments. And it could not, because whatever investment insecurity exists arises from the fact that resource regime negotiations will be held in the future, not because the United States does or does not rafity this treaty. Failure to ratify would not dispell such insecurity; it would simply make it more difficult for the United States to protect its interests.

Those regime negotiations are virtually certain to be held, and we would be wise to put ourselves into the best possible position to effect a positive outcome. A first

step toward that position should be ratification of the treaty subject to our interpretation of key provisions.

Attachments.

[ATTACHMENT A]

AMERICAN BAR ASSOCIATION REPORT TO THE HOUSE OF DELEGATES SECTION OF INTERNATIONAL LAW

RECOMMENDATION

The American Bar Association Section of International Law recommends the following resolution for adoption by the House of Delegates of the American Bar Association:

"*Be it resolved* that the American Bar Association favors the signature and ratification by the United States of the Agreement Governing the Activities of States of the Moon and Other Celestial Bodies, and urges the Senate to give its advice and consent to ratification, subject to the inclusion of the following understandings and declarations in the instrument of ratification:

"(a) It is the understanding of the United States that no provision in this Agreement constrains the existing right of governmental or authorized nongovernmental entities to explore and use the resources of the moon or other celestial body, including the right to develop and exploit these resources for commercial or other purposes. In addition, it is the understanding of the United States that nothing in this Agreement in any way diminishes or alters the right of the United States to determine how it shares the benefits derived from exploitation by or under the authority of the United States of natural resources of the moon or other celestial bodies;

"(b) Natural resources extracted, removed or actually utilized by or under the authority of a State Party to this Agreement are subject to the exclusive control of, and may be considered as the property of, the State Party or other entity responsible for their extraction, removal or utilization;

"(c) The meaning of the term 'common heritage of mankind' is to be based on the provisions of this Agreement, and not on the use or interpretation of that term in any other context. Recognition by the United States that the moon and its natural resources are the common heritage of all mankind constitutes recognition (i) that all States have equal rights to explore and use the moon and its natural resources, and (ii) that no State or other entity has an exclusive right of ownership, property or appropriation over the moon, over any area of the surface or subsurface of the moon, or over its natural resources in place. In this context, the United States notes that, in accordance with Articles XII and XV of this Agreement, States Parties retain exclusive jurisdiction and control over their facilities, stations and installations on the moon, and that other States Parties are obligated to avoid interference with normal operations of such facilities.

"(d) Acceptance by the United States of an obligation to undertake in the future good faith negotiation with other States Parties of an international regime to govern exploitation of the natural resources of the moon in no way prejudices the existing right of the United States to exploit or authorize the exploitation of those natural resources. No moratorium on such exploitation is intended or required by this Agreement. The United States recognizes that States Parties to this Agreement are obligated to act in a manner compatible with the provisions of Article VI(2) and the purposes specified in Article XI(7); however, the United States reserves to itself the right and authority to determine the standards for such compatibility unless and until the United States becomes a party to a future resources exploitation regime. In addition, acceptance of the obligation to join in good faith negotiation of such a regime in no way constitutes acceptance of any particular provisions which may be included in such a regime; nor does it constitute an obligation to become a Party to such a regime regardless of its contents."

REPORT

The Agreement Governing the Activities of States on the Moon and other Celestial Bodies is the fifth international treaty negotiated and endorsed by the United Nations General Assembly which specifically relates to the conduct of States in the peaceful use of outer space. The United States was a principal participant in each of those negotiations, and, with the unanimous advice and consent of the Senate, has become a party to the first four of those treaties.

The initial treaty, which entered into force October 10, 1967, was entitled the Treaty on Principles Governing the Activities of States in the Exploration and Use

of Outer Space, Including the Moon and Other Celestial Bodies.[1] That treaty codified a broad range of basic legal principles which were unanimously accepted by the General Assembly as the foundation for governing State behavior in the exploration and use of outer space. Since 1967 the United Nations has endorsed four supplementary treaties which develop and elaborate on the basic principles contained in the 1967 treaty. The first three such treaties dealt with assistance to astronauts and return of space objects,[2] international liability for damage caused by space objects,[3] and the registration of objects launched into outer space.[4]

The fourth treaty elaborating on the principles of the 1967 treaty is the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, which was endorsed by the United Nations on December 5, 1979. The United States participated in the negotiation of this Agreement during the past seven years and joined in the unanimous approval by the United Nations.

Although the President has not yet signed this Agreement or sent it to the Senate for its advice and consent to ratification, the Secretary of State has strongly defended the Agreement in letters to the Senate Foreign Relations Committee Chairman and others. An Executive branch review of the Agreement is currently underway, and oversight hearings concerning the Agreement by the Subcommittee on Science, Technology and Space of the Senate Committee on Commerce, Science and Transportation are anticipated in 1980.

The Section of International Law has recommended that the Bar Association endorse signature and ratification of this Agreement, subject to the inclusion of the declarations and understandings recommended by the Section.

PURPOSES AND PROVISIONS OF THE AGREEMENT

The Agreement is intended to elaborate and develop existing general principles of law relating to the activities of States on the moon and other celestial bodies. Those principles are reflected in the 1967 Outer Space Treaty (OST) and, as appropriate, in the provisions of the other treaties mentioned in the Report section above.

Article 1 deals with the scope of the Agreement; reference to the moon shall be understood to include reference to other celestial bodies in the solar system as well as to orbits around and other trajectories to or around the moon and such celestial bodies. However, objects in Earth orbit or in trajectories between the Earth and such orbits were not considered as included in the scope of this Agreement.

Article 2 notes that activities on the moon shall be carried out in accordance with international law, in particular with the UN Charter. (Reference: Art. III, OST)

Article 3 states that the moon shall be used exclusively for peaceful purposes, and reiterates the prohibitions in Article IV of the 1967 Outer Space Treaty against the orbiting or placement of nuclear or other weapons of mass destruction as well as those against the establishment of military facilities, the testing of weapons and the conduct of military maneuvers. In elaboration of the 1967 provisions, Article 3 explicitly prohibits the threat or use of force or hostile act on the moon and the use of the moon for such act or threat in relation to the Earth, the moon, spacecraft, or personnel.

Article 4 reiterates and emphasizes the principle of international cooperation in the exploration and use of the moon, and states that due regard should be paid to the interests of present and future generations and to the need to promote higher economic and social standards. (Ref: Art. I, OST)

Article 5 further develops principles relating to public notification and disclosure of information about exploration and use of the moon. (Ref: Art. V, IX, XI, OST)

Article 6 concerns freedom of scientific investigation. In addition to reiterating the basic principle of such freedom without discrimination of any kind (Article I, OST), this Article specifically confirms the right of States to collect, remove and use minerals or other substances from the moon. Although this Article relates specifically to scientific investigation or mission support, the above-mentioned right exists as well in a much broader context, based on the principle that "outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind . . . ." This principle is expressly recognized in Article 9(2). (Ref: Art. I, OST)

Article 7 concerns protection of the environment of the moon and of the earth from activities relating to exploration and use of the moon. In elaboration of that principle, this Article calls for States to notify the Secretary General of measures to protect the environment and of placement of radioactive materials on the moon. In

[1] 18 U.S.T. 2410, T.I.A.S. No 6347, 610 U.N.T.S. 205.
[2] 19 U.S.T. 7570, T.I.A.S. No 6599, 672 U.N.T.S. 119.
[3] 24 U.S.T. 2389, T.I.A.S. No 7762.
[4] 28 U.S.T. 695, T.I.A.S. No 8480.

66-705 O - 80 - 6

addition, it calls for the public identification of areas of the moon having special scientific interest. (Ref: Art. IX, OST)

Article 8 interprets the right of States to explore and use the moon to include activities such as landing on and launching from the moon and placement and movement of equipment and facilities anywhere on or below its surface. This Article also calls for consultations in the event of interference with activities of other States (Ref: Art. IX, OST)

Article 9 relates to the establishment of manned and unmanned stations on the moon. It provides, in particular, that States should inform the Secretary General of the location and purposes of such stations and of changes in their status. In addition, it provides that such stations shall be placed in a manner which does not obstruct free access to all areas of the moon by personnel and equipment of other States (Ref: Art. I, OST)

Article 10 calls on all states to safeguard the life and health of persons on the moon, and to that end applies the relevant standards of the 1967 and 1968 Treaties to the treatment of such persons. In addition, it requires States to offer shelter to persons in distress on the moon.

Article 11.—Article 11 addresses the issues of national appropriation, property and ownership rights, and exploitation of natural resources of the moon. The provisions of Article 11 dealing with natural resources have generated a certain degree of controversy within the United States, and are the principal subject of the "understandings and declarations" suggested in the Recommendation section of this Report.

Article 11 is based largely on principles clearly enumerated in the 1967 Outer Space Treaty. For example, the statement in Article 11(4) that States have the right to exploration and use of the moon without discrimination of any kind is based directly on Article I of the Outer Space Treaty.

The statement in Article 11(2) that the moon is not subject to national appropriation by any means is virtually identical to Article II of the Outer Space Treaty. The 1967 prohibition on national appropriation of areas of the moon or celestial bodies is elaborated but not expanded by the assertions in Article XI(3) that no State (and by inference no other entity) shall have property rights over the surface or subsurface of the moon or over natural resources in place, and that the placement of personnel or facilities shall not create a right of ownership over any area of the surface or subsurface of the moon. However, specific reference in Article 11(3) of this Agreement to "natural resources *in place*" (emphasis added) was added by the negotiators in order to clarify a significant limitation of the prohibition against property rights. In brief, although natural resources in their natural situs are not subject to claims of national sovereignty or property rights, the Agreement recognizes that once such resources have ben moved or extracted they may be considered the property of the extractor (see also Article 6(2)). From the point of view of the United States, the Agreement's explicit confirmation of this interpretation of Article II of the Outer Space Treaty is both appropriate and desirable. Understanding (b) is intended to clarify the United States position on this point.

The controversy concerning Article 11 arises principally from the texts of paragraphs 1 and 5. Paragraph 1 states that the moon and its natural resources are the "common heritage of mankind." This term is without specific, agreed definition, as evinced by the remaining text of that paragraph, which says that the term "finds its expression in the provisions of this Agreement and in particular in paragraph 5 of this article." This term was not used in any of the earlier outer space treaties; however it is being used, with very detailed implementation criteria, in the draft Law of the Sea agreement which is currently under negotiation.

The question has arisen whether acceptance of the term common heritage of mankind in this Agreement connotes acceptance of, or will inevitably lead to, a regime for lunar resource exploitation with the same requirements and procedures contained in the draft Law of the Sea treaty.

It is the view of the International Law Section that use of the term "common heritage of mankind" in the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies does not infer and need not lead to the use in a lunar resources regime of procedures and criteria developed in any other context. There is no generally accepted definition of this term; furthermore, this or any other term may be specially defined for the purposes of a particular text in which it is used. Although Article 11 does not say expressly what "common heritage" means, it does clearly state that the meaning is to be drawn from the provisions of this Agreement. Particularly as there are numerous relevant provisions within the Agreement to which reference can be made, this explicit direction to derive the definition only from within this text would seem to be legally sufficient to counter any assertion that the draft Law of the Sea treaty must be used as a precedent for

the development of the future lunar resources regime. In addition, entry into force of this Agreement may serve as a helpful illustration that this term may be implemented in different ways in different contexts.

The essence of the concept of common heritage in the context of this Agreement lies in the existence of common, that is, equally shared, rights to explore and use the moon and its natural resources. It does not, however, connote specific implementing criteria or procedures. The Agreement provides in Articles 11 and 18 for the development of such criteria and procedures in a future resources regime, consonant with the other provisions of this Agreement; Article 11(7) enumerates four of the "purposes" to be served by that regime. Understandings (a), (c) and (d) above are intended to clarify the obligations assumed by the United States in this regard.

The text of Article 11(5) has been questioned on grounds that the language "undertake to establish an international regime . . . as such [natural resources] exploitation is about to become feasible" (emphasis added) implies a moratorium on the exploitation of lunar resources until such a regime is in force.

Regardless of whether Article 11(5), read alone, may be considered ambiguous on this point, two other factors lead clearly to the conclusion that no moratorium was either intended or established. First, neither this Article nor this Agreement establishes the right of States to exploit lunar resources. That right was recognized in Article I of the 1967 Outer Space Treaty, and may be considered to have existed well in advance of that time. Paragraph 5 cannot, therefore, be read as a conditional grant of a new right, and it does not purport to be a limitation of an existing one. Second, if the drafters had intended to adopt a moratorium, they could easily have done so; the issue was expressly discussed. However, a review of the negotiating history reveals that language specifically calling for a moratorium was, in at least two instances, rejected during the negotiation of this Agreement. Nevertheless, it may be appropriate for the Senate formally to express its view on this matter, and Understanding (d) above is also intended to deal with this issue.

An additional question has been raised about the implications for the United States of Article 11(7)(d), which relates to the sharing of benefits derived from the natural resources of the moon, and other celestial bodies. Article 11(7) states that one of the main purposes of a future international resources regime shall be "an equitable sharing by all States Parties in the benefits derived from those resources. . . ." This paragraph also states that the interests and needs of the developing countries as well as the efforts of those which have contributed to lunar exploration shall be given special consideration.

In the view of the International Law Section, nothing in this paragraph obligates any State to any specific course of action; the "purposes" listed in Article 11(7) are far too general and susceptible to multiple interpretations to be considered specific criteria for national behavior. For example, there appears to be no basis for assuming any particular interpretation of the term "equitable sharing." The possibilities cover an extremely broad spectrum, and all will be available for discussion and debate during the negotiations of the resources regime. However, to minimize any uncertainty on this point, it is recommended that the United States adopt Understandings (a) and (d) above.

With regard to the question of sharing benefits, it should be noted that the principle that "activities in space should be devoted to peaceful purposes for the benefit of all mankind" was clearly endorsed by the Congress of the United States in 1958 in the National Aeronautics and Space Act (Section 102(a)). During Senate consideration of the 1967 Outer Space Treaty, which states that "the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries . . .," the Foreign Relations Committee advised that the Senate give its consent to ratification with the understanding that nothing in that Treaty would diminish or alter the right of the United States to determine how it shares the benefits and results of U.S. space activities.

Although nothing in the language of Article 11(7)(d) appears inconsistent with the position taken by the Senate in ratifying the 1967 Treaty, it may be desirable to attach a similar understanding to U.S. ratification of this Agreement (See Understanding (a) above). Such an understanding should clarify as a matter of law the limits of any obligation assumed by the United States in this regard, and should legally protect the independence and flexibility of future United States negotiators in deciding what, if any, specific obligations should be assumed in a resources exploitation regime.

Finally, a concern has been expressed that the prospect of a future resource exploitation regime will by itself discourage investment of the money, time and effort required for such exploitation until the final form of such a regime is clear.

Two considerations appear particularly relevant in addressing this concern. First, the prospect of such a regime, and hence the question of investment security, will exist whether or not the United States becomes a party to this Agreement. Refusal by the United States to ratify this Agreement would not preclude the initiation of negotiations for such a regime in the future, and in turn would not eliminate whatever investor uncertainty may arise. Such refusal would simply exclude the United States from legal entitlement to the benefits and protections included in this Agreement, and could seriously complicate the prospects of gaining concessions from others in the regime negotiations. In short, it is the anticipation of the worse-case results of the regime negotiations, not the substance of this Agreement, which may give rise to investor insecurity. That anticipation, whether justified or not, will exist regardless of U.S. ratification of this Agreement. Ironically, failure to ratify will probably only make it more difficult for the United States to shape the results of those negotiations.

The second consideration, on the other hand, relates to a possible solution to such uncertainty through national legislation. In this context an analogy to the Law of the Sea negotiating environment may be appropriate; the Deep Seabed Minerals Act (S.493) passed by the Senate acknowledged a period of investor uncertainty and proposed certain government backing. (Senate Report 96–307, 96th Congress, 1st Session, August 9, 1979.) If the Government wishes to encourage early exploitation of lunar resources, and if investor insecurity actually emerges because of the prospect of a future regime, passage of a comparable bill appropriate to the lunar context could effectively serve this national interest. Because negotiation of a lunar resources regime can not be expected to begin for at least several, and possibly many, years, the Congress would have ample time to enact such legislation before such action would be considered a complication of the negotiating process for the regime.

Article 12 relates to jurisdiction and control over personnel and equipment on the moon, and closely follows the relevant provisions of the 1967 and 1968 treaties.

Article 13 obligates a State to notify the Secretary General and the launching State if it learns of the crash, forced or other unintended landing on the moon of a space object not launched by it.

Article 14 reaffirms the principle that States are responsible for national activities on the moon carried out by governmental or non-governmental entities, the latter of which shall operate only under the authority and continuing supervision of the State. (Ref: Art VI–OST).

Article 15 reasserts the principle that all space equipment and installations on the moon shall be open to other States Parties, upon reasonable advance notice and subject to safety precautions and without interference with normal operations. (Ref: Art XII—OST) In addition, this Article provides for consultations upon the request of a State Party which has reason to believe that another State Party is not fulfilling its obligations under this Agreement or is interfering with the rights of the requesting states. Although each State Party is obligated to enter into such consultations without delay upon such a request, no mandatory or binding dispute settlement procedure is imposed.

Article 16 refers to the application of this Agreement to the activities of international intergovernmental organizations.

Article 17 provides for amendments to the Agreement.

Article 18 provides for review of the Agreement, specifying that ten years after the Agreement comes into force the question of its review shall be included in the provisional agenda of the UN General Assembly. This provision does not, however, require any modification or revision; it simply ensures that the issue will be raised. If a conference is convened to review the Agreement, that conference shall also consider whether a regime on the exploitation of natural resources should be established. This Article also specifies procedures for calling such a conference.

Article 19 provides the final clauses of the Agreement relating to signature, ratification, accession and entry into force of the Agreement.

Article 20 provides for withdrawal from the Agreement upon one year's notice.

Article 21 identifies the authentic texts and provides that the Secretary General of the United Nations shall be the depository.

CONCLUSION

Since the beginning of man's exploration and use of outer space, the United States has advocated and pursued a policy of broad international cooperation in its space program. That policy has included not only international technical cooperation and sharing of resulting benefits; it has also included leadership in the development of an effective and respected body of international law which concerns the activities of man in outer space.

The Agreement Governing the Activities of States On the Moon and Other Celestial Bodies appears to constitute an additional, constructive step in the development of that body of law. The Agreement encourages and in some instances mandates the public disclosure by all States Parties of information concerning exploration and use of the moon and other celestial bodies, a policy which the United States has long advocated and pursued. The Agreement also provides more specifically than existing treaties for environmental protection, for the safety of and assistance to personnel, and for the prevention of military activities on the moon and other celestial bodies.

The Agreement reiterates the fundamental principles that all States have the right to explore and use the moon, without discrimination of any kind, and that no State may appropriate areas of the Moon, of other celestial bodies, or of natural resources in place. In addition, it clarifies the right of States to exercise exclusive control and property rights over the natural resources which they have removed from their natural situs. That clarification would appear to be of substantial advantage to the United States as a country most likely to undertake such exploitation.

The reference to the common heritage of mankind, and the provision for an international regime to govern the exploitation of specified natural resources, are consistent with principles recognized by the United States in earlier treaties. Concerns which have been expressed regarding those portions of this Agreement, appear to center not so much on the legal or practical impact of this Agreement as on the potential nature of a resources regime to be negotiated at some date in the future. These concerns are addressed in the understandings and declarations listed above.

The Section of International Law is of the view that the potential benefits to the United States of ratification of this Agreement significantly outweigh any potential disadvantages, particularly in light of the fact that such potential disadvantages would arise not from this Agreement but rather from a subsequent accord which will require separate approval or disapproval. The Section believes that the understandings and declarations suggested above should help guide and protect the position of the United States in any future negotiation of an international resources regime, and should allay concerns that the United States is directly or indirectly restricting its right to engage in or authorize the use of the natural resources of the moon, including their commercial or other exploitation.

For these reasons, it is recommended that the American Bar Association should adopt the resolution contained in this Report.

Respectfully submitted,

LEONARD J. THEBERGE,
Chairman, Section of International Law.

[ATTACHMENT B]

DEPARTMENT OF STATE,
Washington, D.C., May 27, 1980.

Mr. RON STOWE,
Chairman, ABA Aerospace Committee,
McLean, Va.

DEAR RON: This is in response to your inquiry with respect to the legal effect of reservations, understandings and declarations attached by the Senate to its resolution of ratification of treaties. Your question relates specifically to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Treaty).

When a treaty is submitted to the Senate for advice and consent to ratification, the debate will often reveal particular changes or interpretations in the treaty preferred by the Senate. In that case, understandings, reservations, or declarations may be attached by the Senate to its resolution of ratification. If the President agrees with the Senate, he will sign the instrument of ratification with the full text of the Senate's qualifications.

Under international law, a multilateral treaty is, in effect, a set of bilateral treaty relationships. The following rules will govern the establishment of these relationships:

The U.S. instrument of ratification, including the qualifications, will be sent to the depository (in this case the UN Secretary-General) who will inform all parties to the Treaty, and circulate to them the full texts of the U.S. qualifications. International treaty law gives each party one year in which to respond to the qualifications and silence for a year is taken as acceptance. (See Article 20 of the Vienna Convention on the Law of Treaties)

Should a party object within one year to the U.S. reservations or understandings, or any of them, it might do so only for the record, in which case that party's Moon Treaty relationship with the United States would be established, with the U.S.

reservations and understandings fully effective. A party might also object with the stated intention of preventing its treaty relationship with the United States from entering into force. There are no other alternatives. In the latter case, the United States and the objecting state will not have a treaty relationship with respect to the Moon Treaty. On the other hand, the United States and all state parties either accepting, or objecting only for the record, will have a treaty relationship, and the U.S. qualifications would govern. In short, the United States cannot be compelled to accept a treaty obligation to which it has not agreed to be bound. The United States would of course have an identical right to respond to any qualifications attached by other state parties to their ratifications of the Treaty.

A "reservation" by the Senate makes a substantive change in a treaty obligation, and most commonly takes the form of a refusal to be bound by a particular article or provision. An "understanding" is an interpretation of an article or provision. A "declaration" is a statement of policy. If any of these qualifications relate to the international application of the treaty, it is binding in international law as between the United States and the accepting or non-objecting states, and is binding as well in U.S. law. If it relates not to the international application of the treaty but only to U.S. domestic law or procedure, then it is binding in U.S. law and is not relevant for international law purposes.

So, for example, any U.S. understandings on the meaning of "common heritage," "equitable sharing," "in place," the existence or not of a moratorium, or any other subject related to the international application of the Moon Treaty, will be legally binding as between the United States and parties who accept such understandings or who do not object with a stated intention of preventing the treaty relationship with the United States from entering into force.

If other states formulate opposing or different reservations, understandings, or declarations, the United States will have full opportunity to decide whether or not it wishes to accept them, or whether to enter into the treaty relationship with the particular countries involved. There are no circumstances under which the United States could be considered, as a matter of international law or domestic law, as having undertaken legal obligations inconsistent with Senate reservations or understandings. A U.S. domestic court could not construe our treaty obligations in a manner inconsistent with such qualifications. Nor could an international tribunal.

I trust the foregoing is responsive to your inquiry.

Sincerely,

ARTHUR W. ROVINE,
Assistant Legal Adviser for Treaty Affairs.

STATEMENT OF NORTHCUTT ELY

Mr. Chairman and Members of the Committee: My name is Northcutt Ely. I am senior partner in the Washington law firm that bears my name.

I appreciate this opportunity to present testimony on the implications that would result from the Unites States' signature of the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies," frequently referred to as the "Moon Treaty."

I appear here today on my own behalf. As the Section of Natural Resources Law Delegate to the American Bar Association House of Delegates, I had hoped to present that Section's views on signature of the Moon Treaty. However, the incomplete status of internal ABA review procedures, applicable in the event of conflicting section viewpoints, prevents me from presenting the view of the Natural Resources Section as such.

Nevertheless, I would like to submit for the record and for the Committee's consideration the report and resolution adopted by the Natural Resources Section. This report will be submitted on behalf of the Section to the House of Delegates at its 1980 Annual Meeting. Only the House of Delegates is authorized to establish the ABA's policies.

AMERICAN BAR ASSOCIATION REPORT, WITH RECOMMENDATION, OF THE SECTION OF NATURAL RESOURCES LAW TO THE HOUSE OF DELEGATES[1]

RECOMMENDATION

The Section of Natural Resources Law recommends the following Resolution for adoption by the House of Delegates to the American Bar Association:

[1] This report of the Section of Natural Resources Law has been approved by that Section and will be submitted on its behalf to the House of Delegates of the American Bar Association at its 1980 annual meeting. Only the House of Delegates is authorized to establish the Association's policies.

Be it resolved that the American Bar Association opposes signature and ratification by the United States of an "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies," the so-called "Moon Treaty."

REPORT

The United Nations has opened for signature an "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies," the so-called "Moon Treaty." Its key feature is the characterization of all celestial bodies as the "common heritage of mankind" (an expression borrowed from the draft Law of the Sea Treaty), and the parties' commitment to the establishment of an international regime to govern the exploitation of such celestial bodies. Equipment intended to be used by one party would be open to inspection by all.

To enter into the "Moon Treaty" at this time would be dangerously premature. We already have a "Treaty on principles governing activities of States in the exploration and use of outer space, including the moon and other celestial bodies," and three other treaties dealing with activities in outer space. There is no need to rush into a treaty governing "exploitation" of hypothetical celestial resources. The real (and intended) significance of the treaty is the precedent which it would establish with respect to the resources of the seabed and of Antarctica.

Senators Church and Javits, the Chairman and Ranking Minority member, respectively, of the Senate Foreign Relations Committee, in a letter dated October 30, 1979, to Secretary of State Vance, objected to U.S. signature of the Moon Treaty on several grounds, saying:

"After a decade of negotiation at the Law of the Sea Conference, the set of draft treaty articles now before the Conference sets forth an interpretation of the 'common heritage' which does not conform to the national interest of the United States or of other countries with free enterprise/free market economies, particularly as they relate to such matters as production limitations, technology transfer, dispute settlement and competition with the proposed international 'Enterprise'. Furthermore, the formula for control of the international Authority to regulate seabed mining does not provide adequate protection for developed countries in general and the United States in particular."

On the basis of the similarities between the Law of the Sea text and the Moon Treaty, Senators Church and Javits urged Secretary Vance not to commit the United States to the Moon Treaty, but rather to seek a return of the agreement to the U.N. Committee on the Peaceful Uses of Outer Space, and not to sign the treaty unless and until revisions were achieved to protect American national interests. The Department of State, so far, has disregarded the advice of these Senators. The question of whether the United States will sign the Moon Treaty is currently the subject of an inter-agency review in the Administration.

Senators Church and Javits are on sound ground.

As they point out, the Moon Treaty, like the draft of the Law of the Sea Treaty, provides that certain resources beyond national jurisdiction are the "common heritage of mankind." The Third World earnestly hopes that the Moon Treaty and LOS negotiations can be tailored so as to implement the Third World program for the establishment of the New International Economic Order (NIEO), the goal of which is a fundamental redistribution of global wealth. The declared Third World design to achieve that goal is one-nation one-vote control of (1) access to natural resources and (2) global political and economic institutions. The political model is control by the votes of the Third World. The economic model is socialism.

The House of Delegates of the American Bar Association at its 1980 midyear meeting, on recommendation of both the Section of Natural Resources Law and the Section of International Law, adopted unanimously a resolution recognizing the necessity that the Law of the Sea Treaty must provide "assured access" to resources of the seabed "under non-discriminatory terms and conditions." The joint report of those Sections said:

"Since the establishment by the United Nations General Assembly in 1968 of the Ad Hoc Sea Bed Committee, the United States has been engaged in negotiations directed toward the establishment of a regime for the seabed and subsoil and resources thereof beyond the limits of national jurisdiction. From the outset, it was clear that the developing countries viewed the regime for the deep seabed as prototypical to future North-South arrangements across a wide range of economic and natural resource issues. As the concept of the New International Economic Order coalesced, control by the developing countries of global access to the resources of the international deep seabed came to be viewed as the first step toward a fundamental redistribution of the world's wealth through increased Third World control of a broad range of international economic institutions and resources."

This global objective of the Soviet Union and the Third World, not the non-existent need for a regime to govern exploitation of the hypothetical resources of the "celestial bodies," is the true significance of the Moon Treaty. The expectation is that U.S. signature and ratification of the "common heritage" moon treaty would precommit the Senate to acceptance of the same principle of control by the less developed countries and the Soviet bloc of the resources of the seabed and of Antarctica.

Proponents of the Moon Treaty recommend its approval on the basis of unilateral "understandings" to be announced by the United States. But the United States cannot reasonably sign and ratify the Moon Treaty in reliance upon its own unilateral "understandings" concerning the meaning of "common heritage," knowing that those "understandings" are in direct conflict with interpretations of the same expression that are vigorously asserted in the Law of the Sea negotiations by a large majority of States.

Let us illustrate. Proponents of the Moon Treaty recognize that it is necessary, in order to avoid the potential damage to American interests that would be caused by the Moon Treaty's "common heritage of mankind" language, that the United States declare its "understanding" that "common heritage" means that all States have equal rights to develop celestial resources; each State may determine how it will share the benefits of that activity; and a State Party to the Moon Treaty or enterprises operating under the authority of the State may acquire exclusive control of, and property rights in, resources extracted, removed or actually utilized. These declarations, however, are the exact opposite of the concepts of "common heritage" held by the Soviet bloc and the bloc of 119 developing countries, and which they are seeking to incorporate in the Law of the Sea Treaty. These proposed "understandings" are stated in almost the same words as those used by the American delegate ten years ago when he voted in the U.N. Assembly for a declaration of the same "common heritage" principle with respect to seabed resources. That American interpretation has long since been rejected by an overwhelming majority of States which interpret "common heritage" in accord with its Spanish translation, "partrimonio," i.e., exclusive ownership of mineral resources by the State—in this case, the United Nations' agency. In consequence, the expression "common heritage," in the context of international resources, has come to mean, so far as the 119 developing countries and six East European Socialist States are concerned, property which is owned by the U.N. agency created by treaty, and subject to private acquisition only with the consent of a new supranational regime, pursuant to a global agreement. The sharing of "benefits" in accordance with this distortion of the common heritage principle could entail severe production restrictions on private enterprise and very substantial, compulsory transfers of financial resources and technology to the super-government both from States and private enterprise.

Lest it be thought that slight differences in language between the treaty on the "celestial bodies" and the treaty on the sea are significant, one need only refer to recent statements of spokesmen of less developed countries about the Moon Treaty. For example, Mexico's representative recently stated before the U.N. Special Political Committee: "Regarding the treaty on the moon . . . this agreement provided that the resources of the moon were the resources of mankind, just like the 'historic decision' on the resources of the seabed."

The delegate of Peru to the Law of the Sea Conference recently extended the same notion to Antarctica as well as the moon. He said: "The temptation to apply to Antarctica the same principles which were the basis for the regime of the seabed is very great and some have not been able to resist it. This temptation should increase now that the United Nations Committee on the Peaceful Uses of Outer Space has decided to recommend to the General Assembly a draft treaty which would declare the moon also constitutes the common heritage of mankind."

Many competent space engineers and technologists are of the opinion that currently available technology is capable of revolutionary advances in the utilization of space and extra-terrestrial materials to gather and transmit solar energy, to manufacture exotic new materials in high vacuum and low gravity, to use the same phenomena to produce useful drugs and to treat human infirmities. NASA's space shuttle has provided a means by which corporations, academics, nations, and far-sighted individuals may implement innovative research and development projects to identify such productive uses of space and its resources. Many such entities have, in fact, reserved space aboard the U.S. space shuttle, to carry such projects into orbit. It is doubtful that these pioneers were aware at the time of commitment to their projects that the U.S. Department of State was engaged in negotiations designed to declare celestial bodies and their resources to be the common property of mankind to be administered by a future international regime, this being the meaning attrib-

uted to "common heritage" by most of the nations of the world, including the Soviet bloc and some 119 less developed countries.

But there is no need to be drawn into a discussion of whether commercial exploitation of the natural resources of the celestial bodies is or is not likely to become feasible, either in the near future or ever. If not, there is no need for a treaty. If, on the other hand, such exploitation is imminent enough to warrant a treaty, this is a bad one. Under the doctrine of the Convention on Treaties (which some experts believe is declaratory of general customary law in this respect), if our country should sign the Moon Treaty, it is questionable whether the United States could thereafter take any steps inconsistent with the principles of collaboration and consultation with the new supranational regime contemplated in that treaty. The serious concern is that the present U.S. lead in technology would be dissipated as a result of bureaucratic and/or political actions of the controlling regime.

In conclusion: Three serious risks are inherent in signature by the United States of the Moon Treaty. The first is that signature of the "common heritage" Moon Treaty could prejudice (as Senators Church and Javits fear) U.S. negotiations regarding "common heritage" in the Law of the Sea Treaty and regarding Antarctica. The second danger is that the United States would find itself subjected to substantially increased pressure to accept a "celestial bodies" international regime which would control U.S. space investigations. The third is the readily foreseeable claim that a moratorium on exploration and exploitation of space resources is inherent in the Moon Treaty, pending establishment of machinery to govern such activities under the control of the international regime.

In addition, delay would seem to be demanded by the very uncertainties of the exploitation potential, if any, which may be involved. The U.S. taxpayer, who has footed the bill for most of the space technology which would be shared, is entitled to know what his government is giving away, in potential resources as well as in the technology to recover them. Resources can only be known by engaging in at least the early stages of exploitation, which may be a long way off.

Our country has nothing to gain, and potentially much to lose, by signature and ratification of the Moon Treaty.

Senator STEVENSON. The next witnesses are Dr. Charles Sheffield; Dr. Louis Friedman; and Dr. Jerry Grey.

The final witness, Mr. Ratiner, has been rescheduled for Thursday.

Thank you, gentlemen. Please proceed.

STATEMENTS OF DR. CHARLES SHEFFIELD, PRESIDENT, AMERICAN ASTRONAUTICAL SOCIETY; DR. LOUIS FRIEDMAN, MEMBER, PUBLIC POLICY COMMITTEE; AND DR. JERRY GREY, ADMINISTRATOR, PUBLIC POLICY, AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS

Dr. SHEFFIELD. Thank you.

I would like to thank you for the opportunity to address this issue, and say that we have been looking forward to it for quite a long time.

About 1 year ago, when it first appeared that this treaty would be a significant issue to the space program in this country, the American Astronautical Society wrote to its national board of directors, sent them a copy of the Moon Treaty, and asked what they thought of it.

The board, I should mention, is a mixed group of people. It has Members of Congress, it has representatives of industry, people from the universities, and people who work for the U.S. Government.

Congress replied quickly and urged open debate on the subject, saying we needed to get light on the issue. We held that debate in March 1980, at the Washington Hilton and it clarified many issues.

We had speakers for and against the treaty. The Government representatives, in general, simply endorsed the Government's viewpoint.

I stated in our letter to the board that their views would remain anonymous, but apparently they felt it was safer to simply say the same things the Government said. That is, that the treaty was essentially a good idea.

Academia largely felt that the treaty was good and should be ratified, but the most perplexing response was from industry. Industry seemed almost indifferent when we polled them 1 year ago. Some didn't know of the treaty. Others gave very woolly replies.

I was not able to clarify this until finally, in October of last year, I was able to meet in Los Angeles with a number of industrial representatives at the time of the AAS national meeting. I should mention that the comments on the treaty from Congress, Government, academia, and industry board members have been boiled down and given in my written testimony.

I won't attempt to read that testimony here. It's too long and parts of it are probably too detailed. However when I got in front of them over dinner, I had industrial representatives saying, in summary, "We don't really like this treaty, but we are not too surprised by it. We don't feel the administration is too worried at the moment about the health of the space industry, and we feel as if we were left outside when the treaty was developed."

It seems that although we have a free enterprise system in this country, there is no way in which industry can enter directly into the negotiation of an international agreement. What happens is that the Government, as a presumed representative of industry, enters into negotiation, without industry participation, and comes up with a draft treaty.

Now, the treaty we are talking about is one in which the words are explicitly used, "use and exploitation of natural resources." One might expect in a country in which the use and exploitation of natural resources is almost wholly a private concern, that any treaty development in the United Nations would have a panel of U.S. industrialists to advise on the treaty development.

What happened instead was that the treaty appeared without industry participation, and without industry blessing; and only now, when the treaty is a finished written report and a fait accompli, is industry being heard from and asked to provide inputs.

One might argue that it is not an urgent issue, because industry is not sitting waiting with billions of dollars poised to pour into space development and, therefore, the development of the lunar agreement is not a crucial issue.

I think that misses the point. So long as industry perceives that it is on the outside and so long as it perceives that space exploration and use is a low-priority program within the administration, a program that suffers from on-again, off-again funding, that is not attracting the best young people to government service, that is not attracting sufficient research and development funds to provide the backup that industry efforts need, so long as these things are true, there will be a reluctance on the part of industry to invest money in the U.S. space program.

Worse than that, there is a clear feeling on industry's part that the ground rules for industry investment on space have not been laid. If we look at it from this point of view, industry will never be ready to mine lunar resources with industrial funds.

From this point of view, the Moon Treaty, though a significant item, becomes a single data point. It is a single data point that represents a statement about the confidence by private industry in the administration, as the representative of industry's interests in the international community.

It has been stated by several speakers this morning that there is nothing in the Moon Treaty which prevents private industry or anyone else from mining the Moon.

I would like to draw your attention to some specific words in article 11.3 of the treaty, which I will quote:

> Neither the surface nor the subsurface of the Moon, nor any part thereof, or natural resources in place should become the property of any state, international, intergovernmental, or nongovernmental organization, national organization or nongovernmental entity or of any natural person.

I can interpret those words in a number of ways, but I can not interpret them in a way that says industry is free to mine the Moon.

If you are not allowed to own any part of natural resources in place, that says that if you were private industry interested in this, you could go to the Moon and even perhaps mine what is there, but you would have to pay something, an amount still completely undefined, for the privilege of mining those resources.

I feel the worst thing about the Moon Treaty is that the rules of the game for industry are so undefined. In that context, no industrial group who tries to undertake rational financial planning knows what the ground rules are for calculating the return on investment.

Until we have those ground rules, we will find that industry is reluctant to participate, reluctant to play the game.

Then people will point to industry and say, see, there is no urgency. I believe that we have the problem backward. We must have a clear statement of the ground rules before industry can be expected to play the game, and I believe the most important requirement in further negotiation on the Moon Treaty is that we must involve industry. We must find a way in which our representatives at the United Nations are supplemented by industrial groups.

Until that is done, I can not see how we can evolve a Moon Treaty in which we talk about mining and resource development in a way that makes sense to the private industry of this country.

Thank you, Mr. Chairman.

[The statement follows:]

STATEMENT OF DR. CHARLES SHEFFIELD, PRESIDENT, THE AMERICAN ASTRONAUTICAL SOCIETY, AND VICE PRESIDENT, EARTH SATELLITE CORP.

Mr. Chairman and Members of the Senate Subcommittee: I am pleased to be given the opportunity to appear before your Subcommittee and present testimony concerning the Moon Treaty. In giving this testimony perhaps I should explain that I do so wearing two hats. One is that of the President of the American Astronautical Society, which has been studying the proposed Moon Treaty since July of 1979. The Society held a three-hour public debate on the Treaty here in Washington in March 1980, for which I served as moderator and at which numerous analyses and

viewpoints of the Treaty were presented by both public and private groups. The other hat I wear is that of a Vice President of Earth Satellite Corporation, which is one of the few private industry groups whose income is wholly derived from the application of space derived data to problems of resource exploration and resource development. We as a company are very aware of the way in which government actions can quickly stimulate or damp private activity in the resource exploration field on earth. There is no doubth that the same principles of encouragement or discouragement to private capital will apply in off-earth development.

The public debate that I referred to a moment ago was strongly urged by Congressman Donald Fuqua and by Congressman Ronnie Flippo, both of whom serve on the American Astronautical Society's National Board of Directors. Both Congressmen, in separate letters to me written in December 1979, emphasized that debate between knowledgeable and interested parties is a necessary part of bringing issues into the open, and perhaps resolving points of difference.

That debate, prior testimony before a House Subcommittee,[1] [2] and numerous other written analyses make it clear that opinions on both the value and the danger of the new Treaty range over an unusually wide spectrum. It has been variously described as "a reaffirmation of the constructive spirit of the Outer Space Committee," [3] as a treaty which will "doom free enterprise initiative in outer space," [4] and even as evidence that "it is clear beyond reasonable doubt that the U.S.S.R. and its supporters in COPUOS have, and are, executing a careful and deliberate program intended to limit the entry of free enterprise into space." [5]

(COPUOS, the Committee on the Peaceful Uses of Outer Space, is the U.N. body responsible for development of the Moon Treaty.)

It is disturbing to find such a range of views, all honestly held and logically presented. Before offering our views on the probable effects of the proposed Moon Treaty on U.S. industry's attitude to space development, I would like to provide a brief evaluation of these divergent viewpoints, and examine the extent to which they are based on either a misunderstanding of the Treaty's meaning or an unrealistic attitude towards U.N. operations.

REQUIREMENTS FOR SATISFACTORY MOON TREATY

Any useful international treaty possesses a number of properties. Without them, a treaty will be ineffective, short-lived, or a constant source of argument and discontent among its parties.

The proposed Moon Treaty is no exception. It must have these properties, at a minimum:

1. It must be compatible with, or a clear extension of, prior and existing treaties.
2. It should be so far as possible self-contained, not depending for its effectiveness on understandings embodied in other treaties, or on terms that still lack definition.
3. It should be compatible with present scientific knowledge and technological possibility.
4. It should not be so broadly based and all-encompassing that some of its possible implications cannot be estimated at the time of its signing.
5. It should be compatible with the individual national interests of its signers, since otherwise those signers will find reasons to undermine, change, re-interpret, or ignore the Treaty.
6. It must be a needed Treaty, important for the countries who sign it.

Let us examine these requirements in order:

1. It must be compatible with, or a clear extension of, prior and existing treaties. The Moon Treaty has been presented as a logical and natural extension of the 1967 Outer Space Treaty, thus: "Indeed, the discussion in the Outer Space Committee confirmed the understanding that the Moon Treaty in no way derogates from or limits the provisions of the Outer Space Treaty." [6]

Is this the case? The 1967 Outer Space Treaty, which received the advice and consent of the United States Senate without reservations, included in Article I these words: "Outer Space, including the moon and other celestial bodies, shall be free for

---

[1] Testimony by Leigh S. Ratiner before the House Subcommittee on Space Science and Applications, Committee on Science and Technology; September 6, 1979.

[2] Testimony by S. Neil Hosenball before the House Subcommittee on Space Science and Applications, Committee on Science and Technology; September 6, 1979.

[3] Statement by Ambassador Richard W. Petree, United States Deputy Representative to the United Nations Security Council, in Press Release USUN-107; November 1, 1979.

[4] Reference 1 above, page 14.

[5] "Free enterprise and the Proposed Moon Treaty," by Art Dula; Houston Journal of International Law, Volume 2, 1979, Number 1; 1979.

[6] Reference 3 above, page 5.

exploration and use by all States without discrimination of any kind, on a basis of equality * * *."[7]

The above clause appears to set no limitations to the possibility of lunar mining by any party to the Outer Space Treaty.

This statement must be compared with the proposed Moon Treaty, Article XI, paragraphs 4 and 5, which taken together, are clearly inconsistent with the Outer Space Treaty, thus:

"4. States Parties have the right of exploration and use of the moon without discrimination of any kind on a basis of equality, *and in accordance with* international law and *the terms of this Agreement.*" (Italics added)

"5. States Parties to this Agreement hereby undertake to establish an international regime * * * to govern the exploitation of the natural resources of the moon * * *."

The intent of the Moon Treaty on this point is very clear. Use of the moon's resources will take place only under the regulation of the international regime. Although the United States provided to COPUOS a clear statement that it would not accept the idea that the exploitation of the moon must await the establishment of an international regime,[8] the United States would presumably be obligated to operate under that regime once it had been created. Acceptance of this premise would make "exploration and use" as defined in the Moon Treaty markedly different from those same words defined in the 1967 Outer Space Treaty.

This point has been hotly debated. However, the very fact that it has been the subject of argument and interpretation is evidence that subsequent argument and interpretation at the international level is highly probable.

Others who object to the proposed Moon Treaty argue that the precedent set by the draft Law of The Sea Treaty is just as relevant as the 1967 Outer Space Treaty, and much more disturbing. We will return to that point later in this discussion.

2. It should be so far as possible self-contained, not depending for its effectiveness on understandings embodied in other treaties, or on terms that still lack definition. The most controversial Article of the proposed Moon Treaty is undoubtedly Article XI, where in particular the statement that "the moon and its natural resources are the common heritage of mankind" has been singled out as an unacceptable clause from the point of view of possible U.S. industrial development of the moon or other off-earth resources.

The American Bar Association, Section of International Law, favors the signature and ratification of the Moon Treaty,[9] but they urged the United States Senate to give advice and consent to ratification only subject to a number of understandings and declarations. The most significant of these declarations is perhaps this one:

"(c) The meaning of the term "common heritage of mankind" is to be based on the provisions of this Agreement, and not on the use or interpretation of that term in any other context * * *."

This is consistent with Humpty Dumpty's philosophy in "Through The Looking Glass"[10] ("When I use a word it means just what I choose it to mean, neither more nor less") but it cannot be used in developing international treaties. Here we must accept that the meaning of certain words has been set by precedent and by earlier debate and analysis, and the words "common heritage" have been studies in detail in the draft Law of the Sea Treaty. Although there is no unanimity, there is convergence of opinion among the vast majority of nations that make up the United Nations, as suggested in these definitions:

"* * * the common heritage of all mankind—a phrase which is believed by the vast majority of nations to mean common property. Indeed, in several of the official languages of the UN the term used to translate heritage is "patrimony"—the legal equivalent of property in most of the world."[11]

and:

---

[7] "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies"; 610 U.N.T.S. 205 (1967); also known as the "Outer Space Treaty" or the "Treaty on Principles."

[8] "* * * the United States is not prepared to accept an express or implied prohibition on the exploitation of possible natural resources before the international conference meets and agrees on appropriate machinery and procedures and a treaty containing them takes effect. In our view, the Moon agreement cannot reasonably seek to require that exploitation must await the establishment of the treaty-based regime." Statement presented to the Legal Subcommittee of COPUOS by the U.S. Representative; April 19, 1973.

[9] American Bar Association Section of International Law, Report to the House of Delegates; submitted by Leonard J. Theberge, Chairman, Section of International Law, 4/18/80.

[10] Through the Looking Glass and What Alice Found There; by Lewis Carroll; 1896.

[11] Reference 1 above, page 7.

"The common heritage of mankind is the common property of mankind. The commonness of the "common heritage" is a commonness of ownership and benefit. The minerals are owned in common by your country and mine, and by all the rest as well. In their original location, these resources belong in undivided and indivisible share, to your country and to mine, and to all the rest—to all mankind, in fact, whether organized as States or not. If you touch the nodules at the bottom of the sea, you touch my property. If you take them away, you take away my property."[12]

It is difficult to misinterpret the statement above. Although it was made in the context of deep sea resources, there is absolutely no doubt that the same point of view would be applied to extraterrestrial resources also. Further, this view of the term "common heritage" arose during ten or more years of discussion in the United Nations. It seems inevitable that this will be the commonly held view of the term, and therefore to insist that the Moon Treaty will employ a different definition, for its sole use, is simply not feasible. In suggesting that words used in the Moon Treaty should have only the meanings that are defined within that Treaty, the American Bar Association is proposing the impossible. Since their recommendation for ratification by the Senate is subject to such restriction of meaning, that recommendation loses almost all of its force.

In practice, the Moon Treaty must rely on already established meanings, even when it seeks to be a self-contained document. To this extent, the Treaty cannot be fully self-contained, even though this would be a desirable situation. Indeed, it is largely through the efforts of COPUOS that many of the terms in the Moon Treaty now have definite and internationally understood meanings.

3. It should be compatible with present scientific knowledge and technological capability. The proposed Moon Treaty involves some of the same technological issues that have plagued the draft Law of the Sea Treaty. The treaties are to apply to all U.N. members who wish to sign them. In practice, the provisions of both treaties are meaningless unless one of a small handful of countries takes the initiative to mine the deep seabed, or to mine the moon or asteroids. The Moon Treaty thus is valueless to most of the countries who might sign it, unless there is written into it provision for them to share from any possible benefits that may be returned to the United States, Russia, or the one or two other possible space-faring nations of the next twenty years. Lunar exploration is so technologically demanding a pursuit that it is hard to imagine most of the developing nations being able to involve themselves directly in that process through at least the end of this century. Their benefits must come from the development efforts of others.

This technological constraint has naturally translated itself to clauses in the Moon Treaty designed to permit signers without technological capability to occupy vicarious roles in the exploitation of the moon and planets, in particular by receiving a portion of any benefits derived in lunar or asteroid resource exploitation. This is a very natural desire on the part of the developing nations, but it complicates enormously the problems of any private enterprise group hoping to mine the moon.

How much of gross or net sales must go to the other signers of the Moon Treaty? No one can begin to answer that. Will private enterprise even be allowed to mine the moon, given that they have sufficient technical expertise to do it? The answer to that is also unclear. It has been asserted that there is "no moratorium upon the exploitation of the natural resources of celestial bodies,"[13] but the wording of Article XI of the Moon Treaty, particularly the wording of Article XI.3, seems to be directly at variance with such an assertion. ("Neither the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become the property of any State, international, intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person.")

The numerical predominance of member nations of the United Nations who lack all hope of near-term lunar exploitation themselves because of technological limitations inevitably leads to a situation where the only satisfactory Moon Treaty for them is one where they can hope to share the benefits but not the cost. Conversely, the benefit to the United States or a few other technologically equipped nations would be proportionately reduced. We return to this point later.

4. It should not be so broadly based and all-encompassing that some of its possible implications cannot be estimated at the time of its signing. Article I of the proposed Moon Treaty contains the following brief statement:

---

[12] Statement of Ambassador M.C.W. Pinto of Sri Lanka, from "Alternatives in Deepsea Mining: Proceedings, Law of the Sea Institute at the University of Hawaii, Workshop," December 1978.

[13] Committee On the Peaceful Uses of Outer Space, Verbatim Record of the Two Hundred and Third Meeting; statement of Mr. S. Neil Hosenball, U.S. Representative; July 3, 1979.

"The provisions of this Agreement relating to the Moon shall also apply to other celestial bodies within the solar system, other than the Earth * * *."

We now know the lunar surface in some detail, though we still have little information on its interior structure and its history. But based on what we do know, we can make a case for defining rights to use the Moon. In the case of the solar system, however, we do not even know its bounds, still less its composition. Beyond the nine major planets and their moons we have the cometary halo and perhaps many plants still undiscovered. We cannot guess at the technology that will be needed to mine the atmosphere of Jupiter, or the tools that may one day exist to explore planets beyond Pluto. The solar system extends fifty times as far from the sun as the outermost known planet.

Many analysts have pointed out the relevance to the proposed Moon Treaty of the draft Law of the Sea Treaty. When we consider the enormous scope of the Moon Treaty as it is now written, we may perhaps be reminded of another treaty: the Treaty of Saragossa. In that treaty, in 1529, Pope Clement VII divided the whole of the undiscovered world (which included the Americas, East Asia, Australia, and the whole of the Pacific) equally between Spain and Portugal.

It is pointless to attempt to legislate the whole of the universe when we do not even know what is there. The proposed Moon Treaty should abandon any general discussion of the whole solar system and concentrate attention initially on the moon alone. Failure to do so may make it as irrelevant to the real future as the Treaty of Saragossa is today.

5. It should be compatible with the individual national interests of its signers, since otherwise those signers will find reasons to undermine, change, re-interpret, or ignore the Treaty. We may distinguish four different categories of potential signers of the proposed Moon Treaty: technologically developed countries with a free enterprise system; technologically developed countries without free enterprise; developing countries with a free enterprise system; and developing countries without free enterprise.

Each of these types may be expected to have different reactions to the proposed Moon Treaty. In the case of the developing countries, as already remarked, they cannot hope to gain directly from exploitation of off-earth resources, regardless of their free enterprise system or lack of it, by their own programs. They will therefore desire a Treaty that permits them to gain benefits from exploitation conducted by other countries. A country without a free enterprise system will decide to explore the moon and other celestial bodies for reasons that will be generally related to politics, national policies, and the general posture that the country seeks to adopt in the world. Only in countries like the United States, where the technology makes it possible to consider development of off-earth resources, and the free enterprise system prevails, do the difficulties with the proposed Moon Treaty become acute.

This will be discussed in more detail when we come to consider the possible effects of the proposed Moon Treaty on U.S. industry and its attitude to space investment. Here we will simply note that the United States, alone among all potential signers of the proposed Moon Treaty, has the technological potential, today, to embark on exploitation of lunar and other off-earth resources, and has a free enterprise system that would normally lead such exploration and exploitation, as it has led the effort here on earth. (It is, however, very interesting to note that France, which enjoys the free enterprise system and has a rapidly developing space-faring capability, was an early signer of the proposed Moon Treaty. We have seen no analyses of their reasons for doing so, nor do we know if there was much analysis from the point of view of possible impact on their industry before they moved to signature.)

6. It must be a needed treaty, important for the countries who sign it. This is the most clear-cut of all the requirements in terms of the proposed Moon Treaty. The alternative to international agreements of this type is international chaos. However, one might seek to argue that the urgency of the issue in this case is not proven, precisely because no nation, including the United States, is proceeding with an active program to exploit off-earth resources.

To rebut that argument, we should note that, although most of the controversy over the proposed Moon Treaty has concerned itself with Articles I, IV, and XI, there are a total of twenty-one articles in the proposed Treaty. Many of these articles serve highly desirable ends, in that they are concerned with the safeguarding of human life, with the exchange of scientific information, and with confirming certain rights for exploration of the moon and other bodies.

These are very important issues, and confirm that *some* Treaty is certainly needed to define international agreement in those areas. To argue that we need no Treaty, regardless of whether or not the proposed Moon Treaty is a satisfactory

instrument, would be misguided, just as it is misguided to reject the whole proposed Moon Treaty out of the hand based on objections to certain elements of it.

THE PROPOSED MOON TREATY AND UNITED STATES INDUSTRY

For the past decade there has been increasing discussion of ways in which elements of the United States Space Program might be "spun-off" to private industry. There have been bills introduced into both Houses to advance such ideas. The Intelsat model is often pointed to as the way in which such a spin-off to industry can work both nationally and internationally.

Most recently, attention has been turned to the field of earth resources, where an operational earth resources satellite system is now under development, and where stated long-term Administration policy specifically includes as one of its goals eventual total transition to the private sector.[14] It is not unreasonable to assume that we will see, some years in the future, the same sort of desire to make development of off-earth resources a function of private industry, operating under suitable government controls. The same approach has also been suggested for Space Shuttle operations.

One of the points that has emerged clearly in the discussions of commercialization of the earth resources program is the lack of return-on-investment information for a potential private operator. Private industry cannot afford to embark on a commercial operation unless it can determine two basic things: the time-phased investment needed, and the probable time-phased revenues. In the case of the earth resources program, the main uncertainty has been the size of the market, since under government operation there has been a large implicit subsidy which permitted products from the satellite program to be sold far below cost. There is much less uncertainty on the investment side, since the pioneering work on sensor development and ground data handling has already been performed in the government-operated phase.

Compare this with the possible exploitation of off-earth resources. The market is well understood, since the value of minerals on earth is well-defined, even if their value in space is not (though that may be where they will be needed and used). However, the investment side is almost totally conjectural. No one has any idea what it would cost to produce a ton of a particular mineral from extraterrestrial sources, because there are such large uncertainties in two areas: the cost of systems to extract minerals away from earth (including, of course, the costs to go there and return); and the abundance of appropriate minerals. These parameters may not be known well enough for another thirty or forty years to encourage a private investment group to operate on a for-profit basis in the field of off-earth mineral exploration. However, one should expect to see companies interested in the exploration phase of such work—no one is producing oil off the northwest coast of Scotland where the crude is very heavy and the production conditions very difficult, but there are very active exploratory efforts there, which would become production work if the price of oil reaches a suitable level.

In the same way, companies now have an interest in determining the parameters of extraterrestrial resource exploration, although no one is ready to put large amounts of money into it when the return on investment is so ill-defined.

(It seems fair to say that the technology is not the limiting factor in the exploitation of extraterrestrial resources. We could have pursued an active research program ten years ago, and established mining exploration camps on the moon. The technology of the Apollo program was fully adequate to those needs, even though it would not have permitted any large scale exploitation efforts.)

The reluctance to invest capital is increased by an order of magnitude when there is a doubt that private industry will be permitted to recoup that investment. When it is not clear how much of the potential profits generated by an enterprise must be paid to other non-participant groups, then commercial interest dies away very quickly. This has already occurred in the case of deep sea mining, where major industrial consortia are confident of their technology, but have curtailed their investment because of the Law of the Sea Treaty that is now emerging.[15] It will apply equally to extraterrestrial resources if the clause "equitable sharing by all States Parties in the benefits" in Article XI.7.(d) of the proposed Moon Treaty is interpreted as most of the developing countries believe it should be interpreted—as guaranteeing benefits without costs.

In summary, Mr. Chairman, industry has no immediate plans for the exploitation of materials of the moon and other bodies. The costs are too poorly defined, and the

[14] "Planning for a civil operational land remote sensing satelite system; A discussion of issues and options"; Commerce Department Report, (no issue number); June 20, 1980.

[15] Reference 1 above, page 4.

unknowns of material sources and abundances are too great. However, there is certainly industrial interest which we may expect to be translated to the exploration phase of the mining of off-earth materials in the next twenty or thirty years. The proposed Moon Treaty, as it is now written, can only slow industry's involvement by introducing additional uncertainties into the investment/return equation.

On the other hand, we do need a Moon Treaty, and with the exceptions already noted, the proposed Moon Treaty goes a long way to setting up rational standards for the international conduct of affairs in space exploration. From that point of view, it is both necessary and timely. However, the controversial character of certain articles, notably Articles I, IV, and XI, make the proposed Treaty too general and too insensitive to industrial needs.

In saying this, we recognize the thought and hard work that went into the preparation of the proposed Moon Treaty by the U.S. Representatives. It is unfortunate that industrial representatives were not apparently included as an advisory group to our UN representatives, early in the discussions, since the issues are of such potential long term importance to industry. We suggest that this should be done in future discussions of the proposed Moon Treaty.

As a final conclusion, Mr. Chairman, we believe that the countries of the world must develop a new treaty for international cooperation in space. The proposed Treaty, although it has many virtues, also has undesirable features that make it unacceptable as written. For this reason, we suggest that work should continue, to define a Treaty that appears more consistent with the aims of private industry in this country; and we suggest that industry and major space-oriented groups be invited to help with the definition.

Mr. Chairman, I would like to thank you for giving me the opportunity to present our views of an important subject. We believe that open hearings of this type are the best possible way to assure that the United States will obtain a Treaty that serves the interests of all groups within this country

Senator STEVENSON. Thank you.

Dr. Friedman?

Dr. GREY. Thank you. I am Jerry Grey. Dr. Friedman is here to my right.

We thank you for the opportunity to present our views on this important subject to your subcommittee. The AIAA, as you know, is the professional society whose membership of 29,000 individual engineers, scientists and students encompasses all the disciplines relevant to the substance and implications of the Moon Treaty.

We have submitted a full, formal statement for the record. Before responding to the specific queries you have asked us, we have noted in our statement some of the factors and concerns that have been considered in the preparation of our position since we believe they could have some bearing on the substance of these hearings.

First, our paper does not recommend unequivocal support either for or against a U.S. signature and ratification of the treaty. It documents the opposing views on these concerns. Although we will not detail here the article by article commentary on the treaty which appears in our formal paper, there are several practical matters which need to be highlighted.

As Mr. Stowe has so eloquently stated, if the United States eventually decides not to ratify a treaty which retains in its language the designation of a future international regime to govern the exploitation of the national resources of celestial bodies, and which is ratified by a substantial number of the world's nations, and particularly by the U.S.S.R., we will forfeit the right to have a say in the nature of that regime.

Two examples of such a situation are worth citing here: one positive—Intelsat, in which the United States was an early signatory, and because of its technological lead, preserved a significant and economically beneficial role in the resulting international

66-705 O - 80 - 7

regime; and one negative—the International Atomic Energy Agency, in which the current administration's conscious abdication of a role in the reprocessing of spent nuclear fuel has cost us not only the loss of any significant U.S. voice in the international safety regulations governing this process, but also much of our early technological lead in the field, which is now proceeding vigorously in a number of nations.

Many of us in the AIAA believe, however, that the legal details of the treaty, important as they certainly are, don't constitute the dominant issue.

Your questions to us, Mr. Chairman, highlight that issue most effectively. In brief, what is the nature of the future scientific and technological environment in which the stipulations of the treaty will be implemented?

Dr. Friedman will address this issue in detail now. Later I will summarize and respond directly to your specific questions.

Dr. FRIEDMAN. Mr. Chairman and Senator Schmitt, it's a direct result of my working with you last year that I am here today. Your leadership in showing that space development is a practical and important technology for the United States that will reap broad private and public, national and international, and individual and community benefits with new goods and services gave me that broader perspective of my own field of space exploration.

Your first question, how industry might be affected by the agreement, is being dealt with by other witnesses at these hearings. The inverse question is also of some interest: How industry activities affect the treaty or whatever body of law that will eventually be developed on the Moon and other celestial bodies.

This issue encompasses your next three questions: What plans industry has for exploitation of nonterrestrial materials; the state of science and technology for such exploitation; and the schedule under which the exploitation might occur. Thus we treat these three questions as a group.

Clearly, one can find precedents for commercial space ventures. Dr. Grey has cited Intelsat as a model. It is a viable operational entity with 103 member nations enjoying its services and reaping an equitable share of its profits. But a U.S. firm manages and operates the system. U.S. companies have built all the satellites and most of the ground stations, and the United States has launched all Intelsat satellites to date.

Why? Certainly not because of the body of international law extant at that time, but to a considerable extent because when Intelsat was organized, the United States was far ahead of the rest of the world in satellite communications technology.

The opposite has occurred, as Dr. Grey noted, in the international atomic energy reprocessing and safety technology. But what of the technology applicable to the Moon Treaty's intended domain? The United States has spent hardly a nickel on the Moon since 1971, and there is essentially no lunar research in NASA's current 5-year plan.

Plans for a lunar polar orbiter to map lunar materials as well as plans for asteroid exploration have been shelved due to a lessening commitment in the space science program. A recent report by the General Accounting Office has castigated our space industry plan-

ners for underemphasis on space processing research, an essential element in the practical exploitation of nonterrestrial material resources, by a factor of 2 or 3.

There hasn't been an American in space since 1975, and there won't be one until well into next year. The Soviets, on the other hand, have continued to develop and accelerate their manned space operations and, according to a recent article in a national magazine, plan a permanent space station whose potential missions included staging four manned flights to the Moon and to Mars.

Even if such plans are discounted, their 2 years of Salyut experiments have already unquestionably catapulted them ahead of the United States in space processing research, as has been documented by GAO and others.

Other nations in Europe as well as Japan are also beginning active materials processing in space research programs. So if an international regime were set up today, or even in the next half decade or so, to regulate the commercial scale utilization of nonterrestrial resources, the Soviets, and later perhaps the Europeans and the Japanese, would be in a better position than the United States to dominate that regime, just as the United States was able to dominate Intelsat technically when it was set up.

So one answer to your three questions, Mr. Chairman, is that unless there is a major change in our current policy to emphasize and support the development of space technology and exploration, industry will hesitate to formulate any plans for exploiting nonterrestrial materials, not because of any impending legislation, but because the returns are too long-range and too risky, and will remain so without strong Federal R. & D. support.

Here, perhaps, is one area in which this debate on the Moon Treaty and its eventual—and I might personally add positive and inexorable—entry into the international law could be of considerable value to the United States and its industry.

If we focus on your three questions, Mr. Chairman, we are impelled to initiate and support such important programs as an aggressive development of large space structures, an orbiting planned space operations center, a much accelerated space materials processing effort, a vigorous solar system exploration program including especially the asteroids and planetary satellites with eventual sample returns, and a lunar materials prospecting/mining/processing evaluation.

Further, with an internationally accepted Moon Treaty, again with or without U.S. concurrence, wouldn't we be virtually obligated for sheer technological, and hence economic, survival to use whatever space clout we still maintain to involve ourselves in cooperative international programs?

The obvious prime candidate for one of the first of such projects, with the Moon's resources as the carrot, could be the much delayed Lunar Polar Orbiter, an essential first step in defining future lunar prospecting operations. An exhaustive international global satellite power system evaluation to identify the real prospects for nonterrestrial resource utilization would be another.

International multipurpose geostationary platforms operating under Intelsat or Inmarsat types of agreement, a potential boon to developing nations, could serve to smooth the way for active global

participation in formulating an acceptable international regime for dealing with the exploitation of nonterrestrial resources.

Searching for Earth-approaching asteroids and Trojan asteroids in the Earth-Moon system is another candidate. The list of potential activities is virtually endless.

Dr. GREY. In summary, what we desperately need to do—and this is outside the Moon Treaty debate per se, but is closely related to its implications—is to build up an operational capability in those technologies and programs which will insure the United States a primary role in any international regime geared to the provisions of the Moon Treaty, rather than to defer de facto to the Soviets or to others.

Although it is certainly important to decide whether or not, or under what conditions, we sign and ratify the Moon Treaty, the real overriding issue is that U.S. industry be placed in a position comparable to that which is now enjoyed under the existing international regime called Intelsat. The payoff is too far downstream for industry to perform that function alone.

Strong Federal commitment and support are essential to develop such a position. So the direct answers to your questions, Mr. Chairman, are: One, industry will be affected not a whit by any future legal agreement unless it is in a technical position to operate in the regime defined by that agreement. Further, the converse also holds. That is, history has shown that those who do have such technological strength have a strong influence on the nature of any agreement where implementation depended on that technology.

Two, industry has no real plans for exploitation of nonterrestrial minerals to our knowledge, and will not formulate any until the economic, not legal, risk of generating profits from such exploitations has been reduced considerably and the time scale for realizing those profits is no more than a few years away.

Three, the state of science and technology for such exploitation is deplorable—in the United States, anyway—and will not improve substantially until this Nation defines its long-term goals for exploration and colonization of space and makes the commitment—including in the budget—necessary to implement them. The AIAA strongly supports both you, Mr. Chairman, and Senator Schmitt in your dedicated insistence on the need for such a policy and commitment. Perhaps this debate on the Moon Treaty will focus and help to resolve this all important issue.

Four, the schedule under which exploitation of nonterrestrial materials might occur is wholly conjectural unless and until the above mentioned space policy has been defined and the commitment made to its implementation.

With regard to your final question, Mr. Chairman, as to our recommendations for amendments, reservations, understandings, interpretations, declarations, et cetera, some of these appear in the draft position paper I mentioned earlier and will be submitted to you as soon as that paper is released.

Thank you again for this opportunity to present our views on this important subject. We will be pleased to answer any questions you may have.

[The statement follows:]

STATEMENT OF DR. LOUIS FRIEDMAN, MEMBER, PUBLIC POLICY COMMITTEE, AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS AND DR. JERRY GREY, ADMINISTRATOR, PUBLIC POLICY

Mr. Chairman, we thank you for the opportunity to present our views on this important subject to your subcommittee. The AIAA, as you know, is the professional society whose membership of 29,000 individual engineers, scientists, and students encompasses all the disciplines relevant to the substance and implications of the Moon Treaty.

For the past year, the AIAA Public Policy Committee has been developing its viewpoint on the Treaty, having solicited in that process the views of the 68 AIAA Sections located throughout the United States. On the basis of that exhaustive investigation, a subcommittee of the Public Policy Committee, of which Dr. Friedman is Chairman and Dr. Grey is a member, has prepared a formal position paper draft which will be reviewed by the full committee and, hopefully, submitted to the AIAA Board of Directors for approval on August 6, 1980. That paper will be transmitted to you, Mr. Chairman, immediately upon its approval, whether on August 6th or subsequently.

Before responding to the specific queries you have asked us, we would like to take this opportunity to review some of the factors and concerns that have been considered in the preparation of our position, since we believe they could have some bearing on the substance of these hearings.

First, our paper does not recommend unequivocal support either for or against a U.S. signature and ratification of the Treaty. There are those among our members who urge that it be signed and ratified, but only subject to certain understandings and interpretations required to deal with portion of the Treaty which give rise to specific concerns. There are also AIAA members who urge that the U.S. not sign the Treaty at all, or that we sign it only if these concerns are dealt with by rewording the Treaty itself.

The AIAA's position paper documents the opposing views on these concerns. We applaud the careful examination these concerns are now receiving, and commend the individuals and organizations who raised them for public scrutiny. We also stress, however, the urgent need for a comprehensive but flexible body of international law to govern the peaceful uses of so vast and important a resource as that addressed by the Treaty.

Although we will not detail here the article-by-article commentary on the Treaty which appears in our formal paper, There several practical matters which need to be highlighted. First, since five nations (as of this writing) have already signed (although not yet ratified) the Treaty, we would be likely to encounter considerable difficulty in obtaining an agreement to reword the Treaty, whether or not it would be desirable to do so.

Second, there is no real time urgency for the U.S. to sign the Treaty (at least unless and until the USSR indicates its willingness to sign it simultaneously with the U.S.), thereby allowing adequate time for interested members of the public to become fully informed on the concerns of both proponents and opponents of the Treaty.

Third, if the U.S. eventually decides not to ratify a treaty which retains in its language the designation of a future "international regime" to govern the exploitation of the natural resources of celestial bodies, and which is ratified by a substantial number of the world's nations (and particularly by the USSR) we will forfeit the right to have a say in the nature of that regime. Two examples of such a situation are worth citing here, one positive (Intelsat, in which the U.S. was an early signatory and because of its technological lead preserved a significant and economically beneficial role in the resulting "international regime"), and one negative (the International Atomic Energy Agency, in which the current Administration's conscious abdication of a role in the reprocessing of spent nuclear fuel has cost us not only the loss of any significant U.S. voice in the international safety regulations governing this process, but also much of our early technological lead in the field, which is now proceeding vigorously in a number of nations).

Finally, contrary to views expressed by some opponents, it is the opinion of many legal experts, notably the American Law Institute, that the attachment of an understanding or declaration to an international treaty does carry considerable weight. They argue that under prevailing international law (which specifically addresses reservations, but, in their opinion, also applies to understandings), other nations have one year to object to any qualifications we attach, or else they must accept. If a nation objects, there is simply no treaty relationship between that nation and the U.S.; if it does not object, no international or domestic court would hold the U.S. to a violation of that understanding or declaration. Hence this mechanism for dealing with the Treaty, which has been recommended by the American

Bar Association's International Law Section among others, should certainly receive serious consideration by the U.S.

Many of us in the AIAA believe, however, that the legal details of the Treaty, important as they certainly are, do not constitute the dominant issue. Your question to us, Mr. Chairman, highlight that issue most effectively: in brief, what is the nature of the future scientific and technological environment in which the stipulations of the Treaty will be implemented?

Your first question, how industry might be affected by the agreement, is being dealt with by other witnesses at the same hearings. The inverse quesion is also of some interest; how the industry will affect the Treaty or whatever body of law will eventually be developed on the Moon and other celestial bodies. This issue directly impacts your next three questions: what plans industry has for exploitation of nonterrestrial materials, the state of science and technology for such exploitation, and the schedule under which the exploitation might occur. We will treat these three questions as a group, since they are so closely interrelated.

Clearly, one can find precedents for commercial space ventures. There exists today a viable operational entity which the Treaty's proponents often cite as a model for an "international regime": Intelsat. Our purpose is not to debate whether or not Intelsat could serve as such a model, but rather to point out that although its 103 member nations enjoy its services and reap an "equitable share" of its profits, a U.S. firm manages and operates the system; U.S. companies have built all the satellites and most of the ground stations; and NASA has launched all Intelsat satellites to date. Why? Certainly not because of the body of international law extant at that time, but to a considerable extent because when Intelsat was organized the U.S. was far ahead of the rest of the world in satallite communications technology.

But what of the technology applicable to the Moon Treaty's intended domain? The U.S. has spent hardly a nickel on the Moon since 1971, and there is essentially no lunar research in NASA's current 5-year plan. A recent report by the General Accounting Office has castigated our space industry planners for underemphasis on space processing research (an essential element in the practical exploitation of nonterrestrial material resoures) by a factor of 2 or 3. There hasn't been an American in space since 1975, and there won't be one until well into next year.

The Soviets, on the other hand, have continued to develop and accelerate their manned space operations, and, according to a recent article in a national magazine, plan a permanent space station whose potential missions include staging for manned flights to the Moon and to Mars. Even if such plans are discounted, their two years of Salyut experiments have already unquestionably catapulted them ahead of the U.S. in space processing research, as has been documented by GAO and others. So if an "international regime" were set up today—or even in the next half-decade or so—to regulate the commercial-scale utilization of nonterristrial resources, the Soviets (and later, perhaps, the Europeans and the Japanese) would be in a better position than the U.S. to dominate that regime, just as the U.S. was able to dominate Intelsat technically when it was set up.

So one answer to your three questions, Mr. Chairman, is that unless there is a major change in our current policy to emphasize the development of long-term, well-supported federal goals in space technology and exploration, industry will hesitate to formulate any plans for exploiting nonterrestrial materials, not because of any impending legislation but, as our own nonaerospace Corporate Associates Committee pointed out in testimony before a House of Representatives subcommittee last month,[1] because the returns are too long-range and too risky, and will remain so without strong federal R. & D. support. In short, the present state of U.S. science and technology for nonterrestrial materials exploitation is deplorable, and a rational schedule for such exploitation cannot even be devised until specific goals are defined and the support needed to attain them is committed.

Here, perhaps, is one area in which this debate on the Moon Treaty, and perhaps even its eventual entry into the extant body of international law, could be of considerable value to the United States and its industry. If we focus on your three questions, Mr. Chairman, in the light of what an existing Moon Treaty (with or without U.S. ratification) implies with regard to future space operations, will we not be impelled to initiate and support such important programs as an aggressive development of large space structures, an orbiting manned space operations center, a much-accelerated space materials processing effort, and a vigorous lunar materials prospecting/mining/processing evaluation? Further, with an internationally accepted Moon Treaty (again, with or without U.S. concurrence), wouldn't we be

[1] The Space Industrialization Act of 1980, H.R. 7412, sponsored by Don Fuqua, Chairman, Committee on Science and Technology.

virtually obligated, for sheer technological (and hence economic) survival, to use whatever space "clout" we still maintain to involve ourselves in cooperative international programs? The obvious prime candidate for one of the first of such projects, with the Moon's resources as the "carrot", could be the much-delayed Lunar Polar Orbiter, an essential first step in defining future lunar prospecting operations. An exhaustive international global satellite power system evaluation to identify the real prospects for nonterrestrial resource utilization would be another. International multi-purpose geostationary platforms operating under Intelsat or Inmarsat types of agreement, a potential boon to developing nations, could serve to smooth the way for active global participation in formulating an acceptable "international regime" for dealing with the exploitation of nonterrestrial resources. Searching for Earth-approaching asteroids and trojan asteroids in the Earth-Moon system is another candidate. The list of potential activities is virtually endless.

In summary, what we desparately need to do—and this is outside the Moon Treaty debate per se but is closely related to its implications—is to build up an operational capability in those technologies and programs which will ensure the U.S. a primary role in any international regime geared to the provisions of the Moon Treaty, rather than to defer de facto to the Soviets or to others. Although it is certainly important to decide whether or not (or under what conditions) we sign and ratify the Moon Treaty, the real, overriding issue is that U.S. industry be placed in a position comparable to that which it now enjoys under the existing international regime called Intelsat. The payoff is too far downstream for industry to perform that function alone; strong federal commitment and support are essential to develop such a position.

With regard to your final question, Mr. Chairman, as to our recommendations for amendments, reservations, understandings, interpretations, declarations, et cetera, some of these appear in the draft position paper I mentioned earlier, and will be submitted to you as soon as that paper is released. In this area, however, we believe it more appropriate to defer to the recommendations of American Bar Association's various Sections. The issues which need to be dealt with by such understandings were expertly identified by Mrs. Eilene Galloway on pp. 78–80 of your May 1980 Committee Print on the subject, and we would not presume to elaborate further on that excellent treatment.

Thank you again for this opportunity to present our veiws on this important subject. We will be pleased to answer any questions you may have.

Senator STEVENSON. Thank you, Dr. Grey and Dr. Friedman. We look forward to receiving your paper when it's finished.

All of you emphasized the importance of technology development and the preeminence of U.S. technology. Would this treaty, if it were operative, Dr. Friedman and Dr. Grey, adversely affect the development of technology in the United States?

Dr. FRIEDMAN. That would require conjecture, of course. I don't think so, but it depends on what is happening in the spoace program and what the rest of the space policy that this country is following. That is what we're trying to highlight. It is not the treaty, which is the principal governing factor in the industrial or technology readiness, but it is the status of research and development. To whatever extent the treaty, as a doctrine of policy encourages the Government, to sustain a program of development of celestial resources, then it will help. There is an implied commitment in the treaty that scientific investigations and the development of celestial resources and exploration leading to utilization will be encouraged. If there is an active program to meet the terms of that committment the treaty will help. If there isn't, the treaty wouldn't help at all.

Dr. GREY. The treaty, depending upon how we negotiate in the future, specifically leaves that future negotiation up to the time at which we will know what we are talking about. Today we don't know what we're talking about when we discuss the exploitation of the Moon and other celestial bodies.

The position of the United States, in terms of its technological strength, will dictate the terms of that future. I can say that almost unequivocally at this point. If we're weak, we will not have a piece of the Moon or other celestial bodies for industry. If we're technologically strong, it doesn't matter what the other nations will say. They will have little choice, in effect, in how that regime is dominated.

That's why we stress that the important point today and for the next decade is not whether or not we sign a treaty and with what understanding and conditions, but in what position we will be to negotiate when the international regime is formulated.

Senator STEVENSON. Dr. Sheffield, you've emphasized the importance of ground rules to industry. Would rejection of the treaty help establish such ground rules?

Dr. SHEFFIELD. I don't think outright rejection is the right approach. The treaty has 21 articles. Most of them are not controversial. A few of them are. Some of them are very desirable. I think the ground rules that I've been talking about are the ones needed to encourage people to spend money today. Not 10 or 20 years from now. You don't go out in any mining exploration and simply start digging holes. You have a long preparation of research before you begin the mining itself.

Now, if someone in the next year or two could define for the Moon Treaty some of these ambiguous terminologies in a way that industry can really understand and nail down, so when they do a forward projection for 5 years or 20 years they know how much they're likely to lose in windfall profits or any equivalent taxation, then we would be a lot further forward.

For instance, one of the most difficult phrases in the treaty is this question of common heritage. Some nations interpret that to mean that you dig it up, but I own part of it. The American Bar Association said, "Let's define words in the lunar agreement to be used only in the context of the lunar agreement. It doesn't matter what meanings are attached to them elsewhere. We will define them for the purpose of this agreement. I don't think that's a solution.

In the next year or two we should not throw the Moon Treaty out of the window. We should try and clarify the terminology that is in the treaty. Then we may find we have an acceptable treaty that we should not reject, one we will be happy to ratify.

Given the present uncertainties, I think we should not ratify it now. We have to get things clearly defined, and we have to get an agreement about what certain terms in that treaty mean.

At the moment, some of the developing countries have their own clear perceptions of what common heritage means. It's not one I think any mining company would want to go along with if considering an exploration program for the Moon.

Senator STEVENSON. Senator Schmitt.

Senator SCHMITT. Thank you, Mr. Chairman. Thank you, gentlemen, for your comments.

Mr. Sheffield, are you going to follow up also for our record with more specific suggestions on what those definitions should be as our deliberations go forward?

Dr. SHEFFIELD. Other than our written testimony, I had not planned to follow up with any more detailed document. I'm much more concerned that one of the things that should appear next is that we get an industrial representative group to work with our U.N. group, rather than a society like tha AAS.

I work for Earth Satellite Corp., which is one of the few companies that makes its living by using space-derived data in the exploration process. I'll be happy to serve in that capacity on a U.N. panel or elsewhere. But the American Astronautical Society has no further detailed definitions planned, because those definitions seem to be very complex, and to be largely an area in which legal expertise is very necessary. That's not our line of specialty.

Dr. GREY. Mr. Schmitt, one point that was in our prepared testimony but which I didn't state here was one that Dr. Sheffield reiterated. There is no time urgency for ratification of this treaty.

All AIAA members are also concerned that some of the language of the Moon Treaty could use clarification. Whether that is done by amendment or declaration or understanding or reservation, we leave to you gentlemen and to the legal people to determine. Clarification of these points, and with no real time restriction on ratification, means they can be exposed to public debate as they have been so effectively to date.

Senator SCHMITT. What plans do you have to see they are exposed?

Dr. GREY. We're in the process of generating a position paper by the AIAA, which identifies the areas we think are of concern, both the pros and the cons. We plan to publish it in our magazine and distribute it wherever possible to the general public and the press.

Senator SCHMITT. Would you within the context of your annual or regional meetings, use that position paper as the basis for a forum in which they would be further refined?

Dr. GREY. We have already done so. The first of the forums was held by our society weeks ago in Los Angeles. I know the American Astronautical Society held theirs at the annual meeting. I expect that we will have more such forums.

Senator SCHMITT. You expect that activity to continue in parallel with what we do here?

Dr. GREY. Yes. Organizations such as the Office of Technology Assessment are working to provide background data which will continue the exposure of their information as well.

Senator SCHMITT. Were you a bit surprised as I was to hear Dr. Frosch express massive indifference to this?

Dr. GREY. I was not surprised at all. I believe that the indifference to the Moon Treaty he indicated is something I can sympathize with to some degree because of the fact that the important element is not the legalities of the treaty, but establishing our ability to compete in that future world technologically. From that point of view, I believe we're indifferent also.

Senator SCHMITT. I'm surprised at you saying that, because you put so much effort into analyzing the treaty, offering suggestions, and also I think in your testimony indicated that it was a vehicle that could be used in order to reach the objectives you just articulated. How can you be massively indifferent to something that offers an opportunity of that kind?

Dr. GREY. I said I can understand why Dr. Frosch would be massively indifferent. The legal details I personally am not terribly concerned about. I am concerned, however, about the fact that it offers us an opportunity to define some sort of future space program. We've highlighted through the Moon Treaty a very important aspect of the future. That aspect we're very concerned with. We're not at all indifferent to that aspect, as you can tell from our prepared testimony.

Dr. FRIEDMAN. I would like to add a point relative to our position on this. Indifference is perhaps too strong a word. We're not indifferent about the subject of the Moon Treaty, but we choose to focus on aspects of it apart from the text itself, which we believe are actually more important.

We have certain areas of expertise which don't get into the legalities and some of the nuances of the Moon Treaty but is controversial and is of interest to our members. Because of that interest we undertook our study of the treaty and found that the program and a commitment be made for the exploitation, development of technology, exploitation of resources is of greater concern to us. Moreover, we are much more qualified to deal with these subjects than we are with the legalities and nuances of the treaty. Without an adequate U.S. program the treaty will be meaningless to U.S. interests. It's our conclusion that both the legal development and technological development go hand in hand.

Frankly, Mr. Chairman and Senator Schmitt, we don't know the techniques nor even the scale for obtaining celestial resources. We don't know the technology. We don't know the implications of the technology requirements.

A lot of talk has been done this morning about mining. I think that conjures up the image of terrestrial mines. We don't know what will be required, whether it will be global operations or local operations whether it will rely remote sensing or ground survey or even whether and automated operations will suffice or manned bases will be required.

There's a lot of investigation to be done—R. & D. We don't know what the mineral resources are or whether they can be useful. And certainly we don't know the economic benefits. These are studies that have to be done. These are studies we're urging to be done in an active program before we get into debates about property rights, proprietary protection, human rights, et cetera. The international regime will deal with all these other questions that will come into play once we know what the technology is.

Senator SCHMITT. Don't forget there still are basic principles that will apply whether you know the technology or not. The human association, the international association, from experiences in the past. You need to try to define those underlying parameters at the same time you define what is needed to be known technologically.

Dr. FRIEDMAN. I agree and therefore I think the treaty is about the right step. It lays those principles out in getting us started on that procedure. The treaty sets down principles. The regime—which is still to be negotiated—must deal with the details and practicalities.

I return to the fact that to whatever extent the treaty encourages us to get on with exploration and R. & D. it is a help. If it

encourages us to do an international lunar polar orbiter program, that would be great.

Senator SCHMITT. I think you're still saying in the absence of specific policy goals on the part of this country that at least the Moon Treaty is a bit difficult to understand in terms of its impact on nonexistent policy goals.

Dr. FRIEDMAN. I agree we need those policy goals. I think we need that commitment. The Moon Treaty would be empty without a space policy and a program to go along with it.

Senator SCHMITT. Thank you.

Senator STEVENSON. Thank you, gentlemen. The committee stands adjourned.

[Whereupon, at 12:45 p.m., the hearing was adjourned.]

AGREEMENT GOVERNING THE ACTIVITIES OF STATES ON THE MOON AND OTHER CELESTIAL BODIES

THURSDAY, JULY 31, 1980

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE,
Washington, D.C.

The subcommittee met at 9:35 a.m., in room 235, Russell Senate Office Building, Hon. Adlai E. Stevenson (chairman of the subcommittee) presiding.

Senator STEVENSON. The subcommittee will come to order.

This morning we continue our hearings on the Celestial Bodies Agreement which was agreed to in the United Nations last year.

Without objection, there will be appended to the record a letter from Dr. Philip Handler, President of the National Academy of Sciences; a letter from Prof. Stephen Gorove from the law center of the University of Mississippi; a number of statements by the U.S. representatives from the United Nations Committee on Peaceful Uses of Outer Space and the General Assembly, and also a statement by Mr. Northcutt Ely to be printed in Tuesday's record.

Our first witness this morning is Mr. Leigh Ratiner, counsel to the L-5 Society. I invite all witnesses to summarize their statements; the full statements will be entered into the record.

STATEMENT OF LEIGH RATINER, COUNSEL TO THE L-5 SOCIETY; ACCOMPANIED BY GERALD DRIGGERS, PRESIDENT, L-5 SOCIETY

Mr. RATINER. Mr. Chairman, thank you very much for giving the L-5 Society the opportunity to appear before your subcommittee today to present its views on the so-called Moon Treaty. I have every intention of summarizing what is otherwise a somewhat lengthy statement, but I do commend it to the committee, at least to the staff, for reading.

Senator STEVENSON. I see you have been around. It will be entered in the record.

Mr. RATINER. Mr. Chairman, I am accompanied today by Mr. Gerald Driggers, who is president of the L-5 Society, and he will be able to assist me in answering any technical questions that the committee may have.

Mr. Chairman, the L-5 Society is a group of some 4,000 space enthusiasts. Its opposition to the Moon Treaty has been the result of grassroots support, and we have not sought nor received any corporate funding for this particular fight. In part, we took this

approach because we wanted to be sure that our views were not in any way considered to be bought and paid for by the potentially affected industry, although the burden of our concern about the Moon Treaty does relate to the potential free enterprise use of space resources.

Just one quick word of introduction of myself. I am a partner in a Washington law firm and have had long experience in the Law of the Sea Conference, primarily as the chief American negotiator for the deepsea mining issues at that Conference until January of 1977. I served at that Conference in many different capacities—representing the Department of Defense, the Department of the Interior, and the Federal Energy Office, and, of course, under the general supervision of the Department of State when carrying out my negotiating responsibilities.

Further, I should say, Mr. Chairman, I do not represent any ocean mining corporate or other interests at the present time.

Mr. Chairman, there are two simple issues which the subcommittee faces and which were brought out by previous witnesses on Tuesday.

First, what is the "common heritage of mankind?" Is it a vague and ambiguous phrase which can be interpreted in a treaty in a way that is protective of future national interests?

Second, what will be the combined effect on investment decisions in the future of the first question and the pendency of that negotiation?

In addition to this subject, I would also like to indicate some thoughts on the arguments frequently used as to why we should ratify this treaty. Finally, I will speak briefly about ways that we can get out of this dilemma, if we want to do so without at the same time being "bad boys" at the United Nations and jeopardizing other important objectives which we have in the international arena with respect to space negotiations.

First, what does "common heritage" mean? Is it a vague and ambiguous principle?

Mr. Chairman, in using the term "common heritage to mankind" the Moon Treaty uses a phrase which is in no way devoid of legal meaning. It is not a phrase which simply came out of thin air and is susceptible to any interpretation we wish to apply. It is argued—and was argued on Tuesday—that that phrase is expressly limited within the treaty to whatever meaning is defined within the treaty.

Part of the problem of letting lawyers negotiate is that they think the words they use to describe a future negotiation will somehow bind the world body politic when the time comes to negotiate later. The fact of the matter is that the treaty not only uses the phrase "common heritage," but it uses several subsidiary principles such as "the rational management of resources" and the use of resources "for the benefit of all mankind."

You heard testimony from Ron Stowe on Tuesday to the effect that these were all susceptible to interpretations consistent with free access to the resources, a first-come, first-serve mining system. There was also reference made by Neil Hosenball that this "common heritage" regime that has been negotiated somehow stands for principles similar to the 1872 Mining Law in the United States.

Mr. Chairman, all of that is nonsense. The "equitable sharing of benefits" principle stands for two additional subsidiary principles of a more concrete character—taxation, an international taxation code, and an international taxation machinery which is for enforcement of taxes.

At the Law of the Sea Conference that same phrase stands now for the principle that all technology for mining resources at the bottom of the ocean must be transferred to an international organization and to developing countries as a price of having access to the resources at the bottom of the ocean.

The term "rational management," Mr. Chairman, is no idle nice phrase with which everybody can identify. "Rational management" has a clear, unmistakable international meaning in practice. I'm not speaking now as a lawyer. I'm speaking about what the whole world believes and the way in which they behave. "Rational management" has come to mean the right to control the production of resources, to limit the number of extractive operations, in order to protect the economies of developing countries who, in turn, produce those same resources in their countries.

The use of these resources "for the benefit of all mankind"—another phrase that sounds quite attractive—stands for the proposition today in international parlance and in international negotiating forums that, in order for all mankind to benefit, certain parts of mankind should be severely restricted in their access to the resources—particularly the industrialized countries, and more particularly the United States of America.

Mr. Chairman, We are not paranoid. This interpretation is founded on 12 years of negotiating experience in the Law of the Sea Conference. It's written into that treaty. The principle resulting from the "benefit of all mankind" rhetoric is that a country like the United States has more than its share of resources and that the resources should be left in the ground until developing countries have the capacity to extract those resources and use them to benefit their own economies. It is not a principle which somehow calls for fair, free and easy access for highly industrialized countries to those resources. It is just the opposite.

Now, Mr. Chairman, the argument has been made that none of this is relevant to the space experience and that, if we look back to the history of international space negotiations, we will discover some very workable models—Intelsat and Inmarsat have been cited prominently.

A couple of points with respect to those models. First, they do not deal with natural resources which are owned by and mined by developing countries. There was never any competition between the United States and the developing countries to use the resources of space itself. In the case of natural resources, raw materials, there is a potential that in the 21st century Americans might obtain freely resources vital to the economy and industrial growth of this country from space rather than from another location, which might just be a developing country.

Senator SCHMITT. Mr. Ratiner, could I interrupt? There is a changing environment, though, in communications right now. Would you comment on that, in that it is becoming a finite resource?

Mr. RATINER. Yes. You're quite right to point that out, Senator. In the world of radio communications, the whole issue of limited availability has become a common heritage issue. The application of common heritage at the World Administrative Radio Conference to certain frequencies has been put off for a special discrete discussion in a couple years. However, the issue will arise again, because space, at least in this limited respect, has come to be considered as a scarce resource by developing countries who will want to use these frequencies themselves and keep us from using them in the meantime.

Senator SCHMITT. But Intelsat, that model developed in an environment in which it was not perceived to be a limited resource. Is that your point?

Mr. RATINER. That's correct. Moreover, Intelsat and Inmarsat are precedents which relate to organizations created, structured, and politicized in an era preceding the so-called new international economic order at the United Nations. You cannot now create an organization in which the United States of America has the kind of influence it had in the post-United Nations period. International organizations aren't working that way any more. There are efforts in every global organization to change existing charters of such organizations to better reflect the prominence and political importance of the developing countries. The idea of creating a new organization which could function as well as and as efficiently as the old models is anathema to the developing countries. They have 117 votes in the United Nations, and all of these important decisions are taken by a two-thirds vote eventually. So if anybody thinks we can create another Intelsat for lunar resources or asteroid mining, this certainly isn't the decade when he could reasonably expect that could happen.

Senator SCHMITT. Unless it's done within the industrialized nations.

Mr. RATINER. That's correct. That was an option that was considered in the ocean mining experience, which is a good experience for all of us to learn from.

Now, Mr. Chairman, suppose I'm right—even partially right—that it is inevitable that in the negotiation of, or attempt to negotiate, the common heritage regime 155 countries who have spent 12 years defining common heritage in a directly analogous negotiation would try to impose the same basic legal principles on that regime. Then, one must very seriously ask the question: Is it in the interest of the United States to accept in a legally binding document the common heritage of mankind and then proceed, with its eyes open, to try to negotiate a regime which is very unlikely to be varied in much substance from the regime we have just negotiated and agreed to in the Law of the Sea Treaty? I know the latter treaty hasn't been signed yet, Mr. Chairman, but I also know that 99 percent of the present text has been agreed to by the American delegation at the Law of the Sea Conference and very few additional changes are even being sought by the United States.

I don't want to oversell the probability that somehow the Moon Treaty will automatically have to be identical to the Law of the Sea Treaty. But even if I'm partially right, we have to look very

carefully at what are the countervailing benefits of the Moon Treaty.

In the Law of the Sea Conference there were important other advantages for the United States. One of those advantages was the freedom of navigation which would be agreed to by most countries.

So the question is: Does this Moon Treaty provide similar advantages to the United States that would outweigh even the possible disadvantages which I have argued are clear and unmistakable? I think the answer is clearly "No."

The advantages cited by the Department of State for the Moon Treaty basically refer, in all but a few cases, to merely incremental improvements in existing space law. I would appreciate it, with your permission, Mr. Chairman, if I could submit for the record a comparative table which my office prepared showing those areas in which the Moon Treaty slightly improves, if at all, or deteriorates existing space law.

Senator STEVENSON. It will be entered in the record.

Mr. RATINER. Mr. Chairman, the issue of whether or not a moratorium is created was raised and discussed at some length in the Tuesday hearing, and Senator Schmitt was an active participant in that discussion, indicating that the ocean mining companies have suffered greatly.

The administration, on the other hand, argued that the question of a moratorium is nonsense, that there was no legal moratorium in the treaty.

Let me deal first with that issue, without being excessively legalistic. Article II of the treaty obligates states—and I quote—"to establish an international regime, including appropriate procedures to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible."

All parties must negotiate a regime—which may look like another regime we're familiar with, the Law of the Sea regime—as such exploitation is "about to become feasible." How easy will it be to argue, when such exploitation is about to become feasible, that exploitation should then occur at full speed, at the same time we are negotiating a regime for exploitation which we are already obligated to negotiate before that exploitation occurs? That's what the exact text of the Moon Treaty says.

Mr. Chairman, I also ask the question, if the United States must negotiate a regime as exploitation is about to become feasible, which regime will subject exploitation to terms and conditions very different from the ones prevailing before, what company will put $1 billion or $2 billion into a mining venture on the Moon, or to harness the resources of an asteroid, until it knows exactly what those new rules and regulations will be?

It would be imprudent at best, and probably subject the corporation to a stockholder suit for wasting corporate assets. The administration is not filled with corporate lawyers, and therefore it perhaps does not have the same sensitivity that those of us on the outside have to the kinds of decisions that corporate executives must make. However, it's inconceivable that an American mining company would be in a position to make exploitation-size investments while the State Department is just beginning the negotiation

66-705 O - 80 - 8

of a detailed regime, which might take 10 or 30 years to negotiate and might end up looking like the Law of the Sea regime.

So we make a very practical argument, Mr. Chairman—that it simply isn't possible for companies to make investments when they are facing that kind of regime.

Mr. Chairman, I'd like to turn now to a few of the main arguments made by the supporters of the Moon Treaty—who are essentially very few in number, primarily the administration and the people who negotiated the Moon Treaty.

One of the arguments which we hear very frequently is that the United States could always withdraw from the treaty if it turns out not to be good for our interests.

Mr. Chairman, I know this is not the Foreign Relations Committee. If you were to ask the staff of the Foreign Relations Committee to tell you how many treaties of a multilateral character the United States has disliked intensely or found contrary to our national interest and from which we were capable of withdrawing, particularly ones in which an international organization had been established, I think you would find the answer to be close to zero.

It is not practical to suggest that the United States should enter into a treaty with 100 or 155 other countries and then try to withdraw from it later, after everybody has a clear understanding of what the various rights and obligations of American companies are when they are operating in that environment.

Moreover, Mr. Chairman, it is frequently argued by these same supporters that while you can later withdraw from the Moon Treaty, it would be embarrassing to the United States not to sign it.

Mr. Chairman, why do the supporters of the Moon Treaty think that it will somehow be easier in subsequent years to withdraw from a fully negotiated treaty implemented by an international organization than it will be not to sign the Moon Treaty today, when no entity has been created and not a single state has ratified it?

Mr. Chairman, an important argument used by the supporters of the Moon Treaty—and the last of the few major arguments I'd like to deal with in this oral presentation—is that American companies will need this treaty some day, or something like it, because otherwise their rights to mine the resources will not be clear.

Mr. Chairman, I don't argue and the L–5 Society does not argue that there should not be in place at the appropriate time an international agreement which would basically allow the mining claims of states and their private citizens to be recognized and respected by each other. There should be rules to protect the environment and protect the safety of life and property in space. There should be a system for registering such claims. By the way, I'm not speaking now of claims to territory. I'm speaking of claims to the resource body. I don't think it's necessary for us to deal with the issue of whether one can make a claim to the land itself, as long as one has the exclusive right to use it and the resources which are mined in the defined area. There should also be rules to be ensure that entities don't claim large resource bodies and not work them—what we in this country call "work or diligence requirements," rules to require certain levels of effort on the part of

diligent miners. But this treaty is not the treaty I just described. This treaty cannot be made into the treaty I just described.

I was astounded by Neil Hosenball's testimony on Tuesday, because it was so out of tune with reality, particularly since he negotiated the treaty.

The treaty stands for propositions exactly opposite to free access to mineral resources in outer space. His comparison of it to the 1872 mining law, which Senator Schmitt did not like for other reasons, is absurd on its face I will not pursue that further, except in response to your questions. I'm sure other witnesses today will pursue that.

Senator SCHMITT. Could you provide the committee with a more detailed discussion of your objections to that analogy?

Mr. RATINER. I would be delighted to do so, Senator.

[The following information was subsequently received for the record:]

EXPLANATION OF WHY A "COMMON HERITAGE" RESOURCE REGIME CANNOT BE ANALOGIZED TO THE 1872 MINING LAW

The basic components of the resource allocation system enacted in the 1872 Mining Law are as follows:

The hard mineral resources on enormous areas of public lands are opened to prospecting, discovery and the location of claims. Essentially, the government decided to encourage development by "giving away" its ownership of minerals to whoever finds the minerals first.

Any person who discovers a valuable mineral deposit in these areas can acquire exclusive rights to mine all of the resources in the same area by giving notice of and recording a mining claim. The claimant thereby acquires full ownership or property rights in the minerals.

These exclusive rights are limited in the size of area they cover and must be maintained by expenditure of a nominal annual amount ot "work" the claim (generally, $100). The claimant does not have to pay the government anything for the rights.

There are no controls on when and how a claimant can exploit the minerals on his claim. His rights (subject to the $100/year work requirement) are in perpetuity. While mining, the claimant may occupy the claim and use surface resources.

If the claimant is convinced the deposit has commercial value, he may apply for a patent, pursuant to which he acquires actual ownership not only of the deposit but of the land itself.

The "common heritage" principle is interpreted by most nations of the world to mean "common property." Even the United States has accepted in the context of the law of the sea negotiations that the principle stands for common control, if not ownership. Thus, under a common heritage regime, the entire international community must agree on the basic approach to allocating the resources. Looking not only to UN political forums but to domestic resource laws as well, it is obvious that the international community will, at least for the foreseeable future, never agree to encourage resource use by making available free access and ownership on a first-come, first-served basis.

Rather than allocating ownership over a mineral deposit to the first miner who discovers it, the common heritage principle suggests the following approach:

After discovering a mineral deposit, the miner must apply to an international organization for permission to engage in mining the deposit. The creation of an organization to exercise the international community's power to grant or deny its consent to mine is now a well-established part of the common heritage principle.

Permission can be withheld—and the miner will have no rights whatsoever in the deposit—on many grounds, including that the new mineral production would compete with the production of other countries whom the international organization decides to protect and that the miner comes from a country which already engages in more mining operations than the organization thinks is "equitable."

If permission to mine is granted, the rights accorded will be of limited duration, will be conditional on compliance with numerous regulations and discretionary controls of the organization, and will be "paid for" by the miner through substantial profit-sharing and other financial payments and through the forced sale of the miner's technology to the organization and other favored countries.

Mr. RATINER. Finally, Mr. Chairman, what can we do about this? Assuming that this committee and the Senate Foreign Relations Committee are concerned, assuming that you do not find overriding national interest advantages in the treaty, and assuming also that you do not wish to be put in the position of the one country that negotiated the treaty and then said "no" to it: Is it possible to come up with a good way out, a clean way out?

My answer, Mr. Chairman, is most assuredly "yes," and it can be done through a device that is not unique or novel. The simple way to solve this problem and avoid the worst dangers of common heritage is for the United States to go back to the Committee on the Peaceful Use of Outer Space right now, before the treaty is ratified by any country, and indicate what is clearly true, if you read the political tea leaves. That is, that there will probably be no possibility of ratification of this particular treaty in its present form. Not even its principal supporters on Tuesday advocated that it be ratified without at least significant reservations or understandings.

Now, we should tell the United Nations that we do not wish to mislead it and heighten expectations around the world so that ratifications will begin by other countries. We could then suggest that the principal difficulty in our Congress, and legitimately so, was that the negotiators failed to define "common heritage of mankind." Some people say it means free access. Some people in industry say that it means something entirely different, that it means central economic planning under the domination of third world political control of the organization which would manage the resources.

Now with that kind of dispute raging, the sensible thing to do would be to negotiate a protocol, which is the international law form of amending, as you know, a convention. The United States could introduce a protocol defining "common heritage of mankind" and advise the United Nations that it would like to negotiate that protocol, append it to the treaty, and when it is satisfactory, submit both documents to the Senate for its advice and consent.

This is a legitimate way of proceeding in international negotiations. It has been done many times before in international negotiations, and it can be done right now—without the danger of additional ratifications and heightened expectations on the part of other countries.

Its principal advantage, Mr. Chairman, is that the Congress doesn't have to buy a pig in a poke. If the State Department and Neil Hosenball are right that common heritage means free access on a first-come, first-serve basis, we will have it in writing. And if we find out that they are wrong, as the result of the negotiation of a protocol because they can't reach agreement on those principles, we will be very glad that that procedure was recommended and followed.

Mr. Chairman, I would urge the subcommittee at the conclusion of these hearings to have a report and include that recommendation in your report.

Thank you very much and I'll be happy to answer your questions.

Senator STEVENSON. Thank you, sir.

Do you really have any expectation that the United States could renegotiate through a protocol or by some other such means the treaty in a way that explicitly defines "common heritage of mankind" to guarantee free access to all comers?

Mr. RATINER. Mr. Chairman, if I have to make a political prediction, I would say that at least in the foreseeable future, in my understanding of the global economic politics, it would not be possible to do so.

On the other hand, Mr. Chairman, it seems like the only way to resolve the argument between the supporters of the treaty and the opponents of the treaty, may be to make a good faith effort to define "common heritage."

If I'm right about my prediction, you will be very glad this treaty was not given the Senate's advice and consent. If I'm wrong, you will have a good treaty.

Senator SCHMITT. Wouldn't the alternative be for us to just define it as an understanding and say this is the way the United States is going to approach it?

Senator STEVENSON. If you would yield, isn't that exactly what all the countries had in mind? Knowing there could be no universal agreement on a definition, it was agreed to leave the definition up to each of the countries?

Mr. RATINER. No, Mr. Chairman, that is not what any country had in mind.

Senator STEVENSON. That's certainly what the United States had in mind.

Mr. RATINER. I'm not sure, because if you examine any other precedent for this negotiation, you will find that the developing countries understand—that when the international organization is created which will govern the resources pursuant to principles they all feel they well understand—they will have the power to interpret the principles.

The United States will just be another member of that organization. In no way will its interpretation win the day in any dispute in the Assembly of the International Space Authority or in the Council of the International Space Authority or its Tribunal, should it have a tribunal. It's not practical.

Senator SCHMITT. So long as it's based on one nation, one vote and not some other proportional representation.

Mr. RATINER. Well, it will not be based on one nation, one vote because the developing countries know that that's too transparent and it won't get by our Congress. So it will have two bodies, an executive body and a plenary body. In the plenary body, it will be one nation, one vote, and the plenary body will be called the supreme body of the authority. There will also be an executive council to make important day-to-day decisions. We will also be outvoted there, but our vote in that body will look much more important when they write the treaty. The real policy decisions however will be made in the one-nation-one-vote assembly.

Senator STEVENSON. How will this attempt to negotiate what you concede is impossible give business more certainty?

Mr. RATINER. Mr. Chairman, the best situation for business right now would be not to follow the suggestion I have made today but rather to kill this treaty dead, so that no further expectations are

created in the international community that one day we will be a party to a treaty which gives over control of these natural resources.

I'm not here making recommendations for the industry. If I were, it would be to stop this treaty and negotiate no further.

Senator STEVENSON. I can see how that would be good for Japanese business, but you, yourself, conceded this uncertainty would not encourage American businesses to take certain risks. Are you suggesting, then, that there is no way of giving business that certainty short of renegotiation which you concede is impossible?

Mr. RATINER. There are two ways of giving business certainty. The most certain way would be for business to be told clearly, first, that the United States will negotiate no treaty with respect to the resources of space, and second, that business is free to use those resources under existing international space law and the United States hopes that business will develop the technology and do so.

The second less certain way—but perhaps more politically palatable way for many—would be to negotiate a protocol which clearly defined "common heritage" and do it quickly. Then, industry would be able to read the terms of "common heritage" and decide whether it's safe to make investments in the next 10 or 15 years.

Senator STEVENSON. How would you define that term for these resources, the airways, the oceans of the world; the resources in space are not the heritage of the United States, are they?

Mr. RATINER. By no means, Mr. Chairman. First, let's be clear on one thing. Common heritage has been defined by 155 countries, of which the United States holds one of the only dissenting views, to mean common property, Mr. Chairman, in Spanish, in French, in Russian and in Chinese, the term "heritage" does not appear at the United Nations. The term is "property." This has been going on for 12 years and the United States has claimed—and, Mr. Chairman, I was a negotiator that had to negotiate the "common heritage" regime at the Law of the Sea Conference—that "common heritage" had no meaning except the meaning we would ascribe to it in the treaty we were negotiating. However, when you're dealing with 150 other countries who say "heritage" means "property" in 4 of the 5 official languages of the United Nations, common property-like, principles begin to emerge in the negotiation. That's an awful negotiating burden to have to carry around in a protracted and politicized negotiation.

So how I would define "common heritage" and how Neil Hosenball would define "common heritage" are really irrelevant issues. The question is, how will the world define "common heritage" and will we have to live by their definition?

Senator STEVENSON. Then how should we define "common heritage"?

Mr. RATINER. We should define "common heritage" as a resource to which all nations have free access in common and that those who are capable of using the resources and bringing them to world market, and who can demonstrate their capability, be allowed to do so—essentially on a first-come, first-serve basis, subject to reasonable rules and regulations to protect safety, the environment and the exclusivity of claims to particular bodies. That's how I believe it should be defined to encourage private enterprise.

Senator STEVENSON. That is basically already assigned to the phrase by the United States which you concede cannot be negotiated explicitly.

Mr. RATINER. Right, and I regard the definition as assigned to the phrase by the United States as not worth the paper it's written on or the records into which it has been spoken. That definitely cannot in any way control the shape, nature or management of the regime which will dominate outer space some day. It simply isn't valuable to have that statement.

Senator STEVENSON. And you're not concerned that without ratification by the United States other countries will ratify and negotiate an agreement for an international regime without the United States?

Mr. RATINER. Mr. Chairman, again, you're asking for an informed political guess—in my judgment, there's virtually no chance that a substantial number of countries who have the technology and the capability to exploit resources in outer space will ratify this treaty if the United States doesn't. The developing countries may ratify it, because it gives them a leg up on the political process over several decades, but I would doubt seriously if any Western European countries or Japan will sign this treaty until they see whether the United States is going to do so, much less ratify it. France is an exception. I understand that there are reasons for that, that the French basically bypassed all the people in their government who knew anything about the Law of the Sea experience and took it straight up to get approval, and that's how that treaty got signed in Paris.

Senator STEVENSON. Senator Schmitt.

Senator SCHMITT. Mr. Ratiner, don't you see some complications, however, if all the developing countries or a sizable proportion of them and the Soviet Union and its captive nations and surrogates sign this treaty? Doesn't that cause some potential difficulties with the Soviet Union acting as the protector and benefactor of the regime it developed?

Mr. RATINER. I do see some political complications, Senator Schmitt, and that's why I answered the chairman's question a little earlier by saying that I was not opposing any kind of treaty whatsoever. I can see defiecting that possible political cost by urging the negotiation of a protocol and gaining quick support for its negotiation.

Senator SCHMITT. But you're saying that we won't get a protocol that would be satisfactory to what you perceive to be the interest of the United States.

Mr. RATINER. Senator Schmitt, there are really two things that can happen in the future. Either we can negotiate on the basis of having already accepted "common heritage," in which case we will get some kind of second treaty some day which I don't think the Senate will like. Or alternatively, we can try and get the other countries to negotiate some kind of a treaty on a basis satisfactory to us. That's the protocol. In either case, we end up in long protracted negotiation and the question is, where is America's bargaining leverage the best? Is it in a negotiation after signing on to "common heritage," or a negotiation trying to define "common heritage"? And I submit our bargaining leverage is clearly substan-

tially improved if we do not accept the legal principle and then undertake a 10-year negotiation trying to derogate from the legal meaning of "common property" which I think we are all familiar with.

Senator SCHMITT. What if this country put forth a fairly specific, not too specific but a fairly specific set of long-term goals that could be called a space policy, by the Schmitt definition, not by the definitions we heard Tuesday. Would you then think that a treaty negotiation could take place that would be successful?

Mr. RATINER. I think, that if this nation knew its space policy, particularly with respect to resources in the future, it would make it a whole lot easier to write instructions for our negotiators and submit them to a normal clearance process up to and including the President. Then, the negotiator would be told, "Don't agree to anything that doesn't include free access on a first-come, first-serve basis. You may agree to the sharing of certain benefits up to the following limits," and so on. But if we don't know what our space policy is with respect to the resources, then we don't have the slightest idea what we have given away in this treaty and in the subsequent treaty when we start negotiating.

I couldn't agree with your comments on Tuesday and today more. We should have a space policy before we negotiate, but we should have had one before we negotiated the first treaty.

Senator SCHMITT. Do you feel that the treaty should not be greeted with massive indifference on the part of the Government and the Congress?

Mr. RATINER. Senator Schmitt, I worked in the executive branch for 17 years before going into private practice. I felt, listening very carefully to Bob Frosch's testimony, that he was not massively indifferent, although that statement may have satisfied the Administration's position for the moment. I think on balance he said, "I wish this treaty hadn't been negotiated." That's what I heard between the lines.

Senator SCHMITT. But what I'm getting at is your opinion on whether this is a serious treaty that we must be concerned about, not whether you're for it or against it, whether it's a serious issue.

Mr. RATINER. Mr. Chairman, I don't know words to express to you how serious I think this issue is. We're talking right now about setting in place, in my opinion, a regime directly contrary to the national interest of the United States with respect to what may be all of the resources of the 21st century needed by men on Earth, and certainly by the people of this country. I don't know of a more important issue pending in Washington, and I did want to very much thank and compliment the committee for having these hearings. It is unusual in Washington to get this kind of attention on a futuristic issue, particularly an issue like this one, which is vitally important for our children and our grandchildren and their children.

Mr. DRIGGERS. I might inject, Senator Schmitt, that our organization represents 4,000 citizens from all walks of life, who I can guarantee you are not massively indifferent. They have raised tens of thousands of dollars right out of their pockets to pay for the work we've done in fighting this treaty, and that certainly doesn't represent massive indifference.

Senator SCHMITT. Thank you, gentlemen.
Senator STEVENSON. Thank you, Mr. Ratiner and Mr. Driggers.
[The statement follows:]

STATEMENT OF LEIGH S. RATINER ON BEHALF OF THE L-5 SOCIETY

Mr. Chairman, I appreciate having the opportunity to testify today in opposition to signature by the United States of the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies—the "Moon Treaty".

My name is Leigh Ratiner. I am counsel and Washington Representative to the L-5 Society, a non-profit organization of 4,000 American citizens who are enthusiastic about the benefits of space development and industrialization. I am accompanied today by Mr. Gerald Driggers, who is President of the L-5 Society and himself an experienced aerospace engineer. Mr. Driggers has personally participated in several of the studies which have examined space industrialization concepts.

Since the Moon Treaty was opened for signature by the United Nations last December, it has become the subject of wide debate across the country and has received considerable attention from the media. Opposition to the treaty is widespread. If we include the organizations which are seriously troubled by important provisions of the treaty and have recommended either interpretative statements or reservations prior to ratification, it is fair to say that there is overwhelming opposition to the treaty in the form in which it has been negotiated.

Concern, dissatisfaction and outright rejection of the treaty are extensive among space enthusiasts at the grass roots level, and among experts at the professional level and in the legal community. It therefore seems highly doubtful that the treaty in its present form would be ratified, if it were to be signed and submitted to the Senate for its advice and consent. Accordingly, I will give some emphasis today in my testimony on constructive suggestions for salvaging the treaty rather than on belaboring its defects.

Permit me, however, to summarize the defects of the Moon Treaty, then to address some of the principal arguments of the Department of State in support of the treaty and finally to make some constructive suggestions for the future.

SUMMARY OF THE DEFECTS OF THE MOON TREATY

Adoption of a common heritage resource regime

The Moon Treaty establishes the broad principles pursuant to which a second and more detailed treaty would be negotiated, which in turn would regulate all of the resources of our solar system beyond the earth and the earth's orbit. The present treaty declares these resources to be the "common heritage of mankind", a phrase with a long history in the international community widely believed by many nations to be the legal equivalent of common property. (I will address this history in more detail later.)

Even if we accept the United States official view that "common heritage" does not mean common property it has some less restrictive meaning, I believe that the case against applying the principle to outer space resources in the Moon Treaty remains very forceful. At the minimum, the common heritage concept must mean something more than has ever before been internationally agreed with respect to outer space resources. It must mean that all nations have some form of legal interest in the resources of outer space and that those resources can therefore only be developed through a system commonly agreed in advance. A logical prediction is that it is in the interest of most nations to insist on retaining their right to have a say in how such resources are developed through the creation of an international organization of a fairly universal character. In order to exercise the power of common consent which is naturally linked to the common heritage principle, this new organization would have the power to decide when, whether and by whom outer space resources should be developed in mankind's common interest.

Such a system of resource management has never before been tried on a global scale, although an attempt has been made at the UN Law of the Sea Conference to develop such a system for mining deep ocean minerals. At the very least, however, we must assume that it will be difficult for an organization of more than one hundred nations to agree that valuable mineral deposits which are "the common heritage of mankind" can and should become the property of American companies in unlimited quantities, or even in quantities which roughly correspond to the proportion of raw materials in the world economy used by the United States. It is likely to be equally difficult to structure a system for decisionmaking in such a new international organization which does not result in developing countries having a

much greater say as to the disposition of these resources than the United States and like-minded countries.

Frequently, supporters of the Moon Treaty argue that the international law of space has worked well in the past and that we cannot predict how nations will behave in future space negotiations based on comparison with other political activities in the United Nations. They insist that the second resource negotiation called for in the Moon Treaty will be much more prone to follow the examples of Intelsat and Inmarsat, where a nation's control over the regulated activity in space is directly proportionate to its economic contribution and interest in the activity.

Unlike the field of space communications, however, where the resource is technology and space itself, the Moon Treaty concerns raw materials in space, which could conceivably compete one day with mineral resources produced by developing countries. Developing countries must rely on the technology of advanced countries to build a global communications satellite network, and it is in their interest to have such a system developed. In the case of natural resources, it is in their interest to have industrialized countries continue to depend on raw materials produced under the control of developing countries rather than to acquiesce in the creation of a legal regime that encourages the developed countries to obtain such resources freely from outer space. Even if we assume that the prospects for commercial use of extraterrestrial materials on earth are so distant that Third World producers will not be motivated by competitive concerns, there is still little chance that these same countries will be prepared to agree to a legal regime for outer space resources significantly different from the basic approach to resource extraction now utilized on earth. (I will elaborate this point later in my statement.)

There is no question that the resources of the moon and other celestial bodies are beyond the boundaries of nations, and to that extent, may be regarded as international in character. Recognition of the principle that resources have an international character, however, does not necessarily require a legal regime for those resources that places them off limits to nations with the technological capability of exploitation, unless and until common consent is given by all nations—none of which has any legal claim to these resources located outside all nations' jurisdiction.

Traditionally, international law has recognized that, with respect to unclaimed areas, assertion of jurisdiction and effective occupation are sufficient to acquire ownership. The Outer Space Treaty of 1967 prohibits the acquisition of ownership rights over the moon and other celestial bodies, but that treaty does not establish the same legal principle for lunar and celestial body resources. Under present international law, the resources of outer space are available for use by those with the capability to extract them. The issue confronted, then, in the Moon Treaty is the extent to which that basic rule should be changed in order to provide a greater degree of international regulation and assure more widely distributed benefits in the use of those resources than would occur under the historic principle of discovery, claim and occupation. In our judgment, the Moon Treaty answers that question by eliminating the present regime of open access and unlimited resource use and by substituting a new set of legal principles, built around the common heritage concept, which require the common consent of all nations before the United States and those few other countries with the capability can discover, extract and utilize these resources. The supporters of the treaty, of course, do not subscribe to this view but they do admit that implementation of the common heritage principle through a subsequent agreement will change the present regime for space resources in fundamental, but as yet unknown, ways.

We cannot today predict the role which nonterrestrial materials in our solar system may play in mankind's future. These may assume an importance in the 21st Century of gargantuan proportions. Hence, decisions about how the international community will regulate their use must be scrutinized very seriously. It seems to us inconceivable that the United States such dispute as to their meaning by learned and experienced American citizens.

If this Committee were to restrict its consideration of the Moon Treaty to this single issue—that the Moon Treaty adopts a principle for future resource exploitation which has no agreed meaning—we are convinced that the members would conclude that the treaty should not be ratified without a much clearer understanding and agreement among nations on the nature of the legal system which is being established for the regulation of the resources for the next century.

In the case of the "common heritage" principle, however, it is unnecessary to rely on guess-work about how other countries will interpet it in the context of the Moon Treaty. We have twelve years of experience in attempting to define the very same term in the deep seabed negotiations at the Law of the Sea Conference.

There are those who argue that the Law of the Sea Conference is not an appropriate parallel from which to derive guidance. They prefer instead to rely on previous

outer space treaties as being more suitable bases for comparison. As pointed out earlier, the previous outer space treaties are probably not very useful precedents because they do not involve the regulation of natural resources similar to those produced today by developing countries. To our knowledge, the only global experience in common management of such resources is the Law of the Sea Conference. It therefore appears only prudent to examine the United States experience in negotiating a deep seabed minerals regime based on the common heritage principle, so as to have a basis for predicting what our experience will be in future lunar resource negotiations.

Before describing the parallels between the Moon Treaty and the deep seabed negotiations and explaining why they will exert greater influence than those with other international conventions, let me provide the Committee with information about my own qualifications in these areas. I am a partner in the Washington law firm of Dickstein, Shapiro & Morin. My practice concentrates in the field of international law and natural resources. My clients include corporations both large and small, domestic and foreign, as well as one foreign government. All have an interest in the discovery and development of basic raw materials and natural resources. Before entering private practice, I was a United States Government official for fifteen years. In that capacity, I served a number of federal agencies including the Department of the Interior and the Federal Energy Office and was responsible in those agencies for international resource problems. From 1969 to 1977 I was a member of the U.S. Delegation to the Law of the Sea Conference and during that time was for four years the principal American negotiator for the resources of the deep seabed.

Parallels with the deep seabed regime at the Law of the Sea Conference

There are approximately 90 countries in the world today which did not exist in the 1950's. They are virtually all poor. Almost all of them were colonies before their independence. In their struggle to obtain independence, they found in many cases that while they were free, they were worse off economically than they had been before. Rather than renounce their new-found freedom, they have sought to act collectively to strengthen their bargaining position with the industrialized countries of the world. This began to occur in the early 1970's and is still occurring. The process gained in intensity when, in 1973, OPEC demonstrated its ability to cause, through concerted political and economic action, a massive transfer of wealth from the rich countries to the poor.

During that same period the developing countries of the world formed a political caucus known as the Group of 77, which began to formulate common positions on all of the economic subjects which found their way into the UN negotiating system. The Group of 77 in the early and mid-1970's developed a manifesto for this emerging revolution in international affairs. They prepared a declaration calling for the creation of a New International Economic Order. The underlying rationable of that document is the assertion that fundamental justice requires that those who receive the raw materials and natural resources which fuel and feed industrial economies must be required to pay a significant share of their economic wealth in exchange for access to those resources. The so-called North-South dialogue is a direct out-growth of that declaration. Third World enthusiasm for this new movement caused the spread of this new ideology to every available forum in the United Nations. These concepts have now been deployed in the UN Conference on Science and Technology, at the Law of the Sea Conference, in UN debate about the natural resources of Antarctica, and have even been raised in forums concerned with outer space issues, for example, at the 1979 World Administrative Radio Conference.

The principle of the "common heritage of mankind" being negotiated in the political arena at the Law of the Sea Conference was chosen as the first available slogan for the concrete elaboration of the New International Economic Order doctrine at a law-making conference. As I will explain, many of the Third World's important objectives embodied in the New International Economic Order have now been achieved at the Law of the Sea Conference. Given this success and the importance of control over natural resources to the politico-economic philosophy of the Third World in the UN political arena, there is every reason to believe that the Law of the Sea Conference will exert strong influence over the negotiation of the second moon agreement.

I readily admit that the law of the sea treaty may not be copied verbatim by those who negotiate the second moon agreement, but I do believe it will be very difficult for the world community to stray in any substantial way from the legal principles which 150 nations have struggled for twelve years to establish over natural resources akin to those of outer space.

Mr. Chairman, when the Law of the Sea negotiations formally began in 1970 with the adoption of a Declaration of Principles by the UN General Assembly, there was

no consensus on the meaning of the common heritage principle. Today, that principle has been well defined in international custom and practice, even though a few of the final details of the emerging law of the sea treaty may not yet be agreed.

In the course of the deep seabed negotiations, developing country spokesman, now with the support of the industrialized countries including the United States, have found in the common heritage principle an imperative for:

Creating an International Authority to govern the exploration and exploitation of these resources;

Empowering such an Authority itself to undertake directly deepsea mining activities;

Prohibiting the exploitation of common heritage resources, where it would adversely affect the economies of developing countries producing the same raw materials;

Limiting the retention of profits by private enterprises extracting common heritage resources; and

Requiring such enterprises to transfer to the new international organization all of the resource extraction technology.

In large part, the deep seabed texts contained in the draft law of the sea treaty reflect these interpretations of the common heritage. Moreover, these Third World positions have been buttressed by subsidiary principles contained in the 1970 Declaration of Principles for deep seabed resources which closely parallel the present moon treaty's list of purposes to be served by the subsequent agreement on lunar and other celestial body resources.

For example, the concepts of "orderly and safe development" and "rational management" of resources found in Article XI, paragraph 7, were also contained in the 1970 Seabed Declaration and are interpreted by most of the world to mean central economic planning and control of the development and marketing of resources. The principle of "expansion of opportunities in the use of those resources" in that provision of the Moon Treaty parallels language in the 1970 Seabed Declaration which ultimately evolved into the foundation for Third World demands that access to deepsea resources must be artificially restricted for industrialized countries, so that developing countries can have a chance to participate, either on their own or through an international mining monopoly operated directly by the new organization. Even the seemingly innocuous principle of "equitable sharing of benefits" found in both documents has come to be a code-word for a system of international taxation of profits made by commercial resource developers. Since the term "benefits" is not restricted to the financial realm, the principle has also been used to justify insistence on mandatory transfer of the technology used to exploit the resources.

In view of the substantial parallels between the 1970 Seabed Declaration which served as the blueprint for the law of the sea negotiations and Article XI of the Moon Treaty which will serve as the blueprint for a second negotiation on outer space resources, it is difficult to see how the United States can fail to study very carefully the results of the Law of the Sea Conference before agreeing to apply the same legal principles to outer space resources. At the minimum, prudence would require that we await the conclusion of the Conference and observe the degree to which the law of the sea treaty is successfully implemented. If the deep seabed regime works, we will all be reassured about undertaking the experience again with respect to resources of even greater importance than those at the bottom of the ocean. If it does not work, the United States will be glad it was patient before signing and ratifying the Moon Treaty.

Moratorium on commercial exploitation of resources

United States companies, in both the aerospace and mining fields, are expected to consider over the next twenty years the possibilities for investment in technology development looking towards the future utilization of the resources of the moon. When they do so, corporate decision-makers will examine the available precedents and review the Moon Treaty. In our judgment, the Moon Treaty will be a potentially crippling disincentive to investment in these R. & D. activities. Corporations will see it in their investment to await the conclusion of the second lunar resource negotiation before moving forward to design and test resource exploitation concepts. Unfortunately, by the terms of the Moon Treaty, these subsequent negotiations will not commence until exploitation is "about to become feasible"—in other words, until private enterprises or governments make the very financial commitments to R. & D. programs which are deterred by the uncertainties inherent in the provision for a future agreement and exacerbated by the adoption of the common heritage and related principles.

Supporters of the treaty argue, legalistically, that there is no moratorium on resource exploitation pending the negotiation of the second moon agreement. I am

prepared to argue that Article XI of the Moon Treaty does establish an implicit moratorium, but I do not wish to be legalistic.[1] The fact is that a prudent businessman will not make significant investments of time, energy and creativity so long as the political environment is as I have described it in this testimony.

RESPONSE TO ARGUMENTS IN FAVOR OF THE MOON TREATY

Let me turn to some of the arguments used by the supporters of the Moon Treaty.

Some supporters of the Moon Treaty argue that the United States can always withdraw from the treaty, if we do not like the way it is being implemented. Specifically they suggest that there is no reason why the United States must join in a second moon agreement, if we are dissatisfied with the manner in which the common heritage principle has been applied. There are two problems with this approach. First, it is these same proponents who are now arguing that United States diplomatic and foreign policy interests will be significantly injured if we refuse to ratify the first Moon Treaty after we spent ten years participating in its negotiation. Is it not even more likely that injury to our diplomatic interests will be perceived as a possible consequence to United States withdrawal from a treaty after we have ratified it? And how will the United States be in any better position to renounce the outcome of the second lunar resource negotiations than it is now alleged to be in respect to the present treaty?

Second, all prior experience indicates that, when the United States finds itself in an uncomfortable position in an international organization, it is rarely able to muster the necessary political consensus to withdraw. One can probably count on the fingers of one hand the number of times the United States has been able to do so in the 20th century. Yet serious American interests are much more frequently compromised in the implementation of international agreements to which it remains a party.

In the circumstances of the Moon Treaty, Mr. Chairman, with the risk of mistake as high as it is and the stakes as important as they are, reliance on the future ability of the United States to withdraw without cost from the Moon Treaty seems to be at best a very frail justification for ratification.

The second major argument used by the Moon Treaty's supporters is that the treaty is a progressive improvement over prior outer space treaties, because it strengthens provisions on demilitarization and freedom of scientific inquiry. Some have even suggested that because it provides the beginning of a legal regime for resource development, the treaty will assist companies in planning industrial projects. In that connection I would like to submit for the record a comparative analysis prepared by the L–5 Society on the extent to which these alleged benefits are already available in the body of law comprising the existing outer space treaties. This analysis demonstrates that, in a few areas, modest improvements have been made in the body of international space law, but that in most cases the Moon Treaty affords no significant advances and, as I have already discussed in detail, adds provisions on resources which are detrimental to the national interest.

The third argument which is used by supporters of the treaty is that United States signature and ratification will promote harmony in the UN Committee on the Peaceful Uses of Outer Space, thus enabling us to gain other bargaining advantages, primarily in ongoing negotiations concerning communications satellites and remote sensing satellites. The basic concern seems to be that United States rejection of the Moon Treaty might in some manner undermine the principle of consensus decision-making which has been used in the Committee since its inception. The difficulty with this reasoning is that there is no evidence that our successful negotiation of previous space treaties or the preservation of the consensus principle is attributable to some general sense of goodwill. Rather one must look to the virtual monopoly held by Western countries and the Soviet Union over the technology needed to conduct these space activities in order to find the explanation for the relatively noncontroversial development of space law to date. Indeed, a sound argument can probably be made that United States acceptance of the Moon Treaty and

---

[1] Article XI, paragraph 5, of the Moon Treaty obligates States Parties "to establish an international regime, including appropriate procedures, to govern the *exploitation* of the natural resources of the moon as such exploitation is about to become feasible" [emphasis added]. One clear reading to this language is that the new regime must precede actual exploitation. This interpretation is supported by the following considerations: (1) the Moon Treaty contains no express recognition of the present right to engage in "exploitation" (the present rights of "exploration and use" being distinguishable from exploitation); (2) Article VI, paragraph 2, the one provision which recognizes the present right to use resources, is limited to use for scientific investigations and, by negative inference, prohibits use for commercial purposes; and (3) the same ambiguities which encouraged developing countries to argue that the 1970 Seabed Declaration established a moratorium on unilateral deepsea mining are contained in the Moon Treaty.

the common heritage doctrine it entails will do more than any other action to undermine the prospects for future success in the Committee's negotiations.

A fourth claim often made to support United States ratification of the Moon Treaty is that this country, despite its enormous technological capability and interest in lunar resources, will be excluded from future negotiations of the second moon agreement if we do not ratify the Moon Treaty. We will lose forever, in the opinion of some proponents, the opportunity to participate in formulating future international law governing the exploitation and use of lunar and other celestial body resources.

Mr. Chairman, this perspective on the process by which nations create international law is out of tune with political realities. First, it is important to understand that absolutely nothing in the Moon Treaty prohibits the parties to that agreement from including non-parties in subsequent negotiations to elaborate a new agreement. Thus, even if the Moon Treaty were to enter into force without the participation of the United States, there would be no legal bar to our joining in the second moon agreement negotiation. Second, the very enormity of the United States political and economic interests in lunar resources, together with our near monopoly over the technology necessary to exploit them, makes it literally inconceivable that the rest of the international community would attempt to proceed without our participation. And third, these same considerations mean that it is legally impossible for other countries—either by treaty or practice—to establish an international legal regime that is binding on the United States unless we acquiesce in that regime. As a matter of commonsense, it seems to us indisputable that United States influence over the content of a second moon agreement would in fact be greater if we refuse to sign and ratify the present Moon Treaty than if we accept it and the common heritage doctrine it incorporates.

Finally, supporters of the Moon Treaty argue that the United States will need such a treaty some day in order to develop these resources and that the political situation is likely to deteriorate rather than improve. Essentially, they appear to believe that the treaty we have in hand today is better than the treaty the United States will be able to negotiate tomorrow. This argument is perhaps the most disturbing of all, since its proponents do not seem to recognize that the second moon agreement called for in the Moon Treaty would be negotiated in that same deteriorated political climate they predict. The only logical extension of this argument is that the second moon agreement is likely to be much worse than the present Moon Treaty. In addition, the proponents allege that United States negotiators will be able to define common heritage in the second moon agreement in a manner much more advantageous to our national interests than has been accomplished at the Law of the Sea Conference. It is difficult to imagine how our negotiators can achieve this feat in an international political climate for space resource negotiations which is acknowledged to be steadily deteriorating.

POSSIBLE NEXT STEPS

Mr. Chairman, the L–5 Society believes that United States interests would benefit from a treaty on the resources of the moon and other celestial bodies which is designed to promote exploration and exploitation and at the same time protect the safety of human life and the environment once industrial activity occurs in outer space; which ensures that countries respect their reciprocal rights to extract resources; and which guarantees that countries do not claim resource deposits as a matter of hegemony but rather restrict their claims in direct relation to their capabilities to extract the resources and use them. Indeed, some have argued that the United States interpretation of the common heritage concept embodies these same principles. If these concepts, together with the principle of free access, were to represent the agreed guidance provided in the Moon Treaty for the subsequent regime, the L–5 Society would be supporting United States ratification. It is very doubtful, however, as my testimony explains, that other countries presently interpret the common heritage doctrine in the Moon Treaty as incorporating these concepts.

The solution to this dilemma, in our judgment, is to negotiate an agreed definition of "common heritage" before accepting it as a binding legal principle. By doing so, the United States would forever defuse arguments by developing country negotiators about the logical derivations of a principle it has already accepted. I expect that any experienced United States negotiation at the Law of the Sea Conference will confirm that the negotiation of that treaty has been so difficult for the United States, because we attempted to define "common heritage" after having accepted it as a principle to which most nations ascribed an independent and well understood meaning.

For this reason, we urge the Committee to consider a new course of action which is consistent with traditional diplomatic practice. We would recommend that the Administration not submit the Moon Treaty to the Senate for its advice and consent, but instead inform the UN Committee that, if submitted, the treaty is unlikely to be ratified. The United States Delegation should explain that the principal difficulty with the treaty is the uncertaintly as to the meaning of the common heritage principle, and it should propose to include on the work program of the Legal Subcommittee the subject of the negotiation of a protocol to the Moon Treaty setting out the definition of the phrase "the common heritage of mankind", as it is used in the Moon Treaty.

Then, the United States Government should engage in consultations with industry and other public advisors in order to prepare a draft protocol for submission to the Legal Subcommittee. We would recommend that the draft protocol be structured to incorporate the following principles:

States would have absolute and unrestricted rights to explore for, recover and use space resources;

Each State would determine whether and how its own nationals could engage in resource activities but would have the responsibility of controlling national activities to ensure compliance with safety, environmental and due diligence requirements of the regime;

States would acquire title to specific resource bodies upon discovery and notification to an international registration office;

Other States would only be bound to respect such resource claims, however, where they satisfied agreed international criteria relating to size, duration and non-interference with other uses;

Disputes over any State's compliance with the regime would be submitted to binding international arbitration;

The States Parties to the regime would engage in periodic consultations concerning scientific and technological developments with a view towards developing recommended standards and practices for avoiding environmental harm and protecting human life and health in carrying out resource activities in space; and

Decision-making procedures would ensure that individual States exercised influence commensurate with their economic interests.

Finally, the United States should inform the UN Committee that, when the protocol satisfactory defines the common heritage principle, it will submit that protocol together with the original Moon Treaty to the Senate for its advice and consent.

This approach, Mr. Chairman, will resolve the legal controversy over the meaning of common heritage, without at the same time requiring the United States to ratify the Moon Treaty while it entails the substantial risk of forfeiting the future access of this nation to the resources of outer space. To the best of our knowledge, no State has yet ratified the Moon Treaty. If we follow the course of action we are recommending today promptly, there is every chance that it will succeed. If the United States fails to pursue the protocol option and other major nations begin to ratify the Moon Treaty, the political climate will change, making this course of action more difficult.

I appreciate very much the opportunity to appear before you today and would be happy, together with Mr. Driggers, to answer any questions you may have.

Thank you, Mr. Chairman.

Attachment.

RESPONSE TO DEPARTMENT OF STATE—ARGUMENTS IN SUPPORT OF THE DRAFT MOON TREATY, NOVEMBER 5, 1979 [1]

BENEFITS ALLEGED BY THE DEPARTMENT OF STATE AND RESPONSES

1. Safeguarding human life on celestial bodies

—Obligation of parties to inform of phenomena that could endanger human life and of any indication of organic life.

Response. The provision of the moon treaty to which the State Department refers closely parallels, and makes only minor changes to, existing international law. While Article V, paragraph 3, of the moon treaty obligates States Parties to inform others of phenomena in outer space that could endanger "human life or health," Article V of the Outer Space Treaty already imposes a duty to inform of phenomena "which could constitute a danger to the life or health of astronauts." The term "astronaut" is not actually defined in the body of international law

[1] The material as received by the committee was in two columns. It is printed here with the response following the benefit alleged. Each benefit alleged is preceded by a —.

concerning outer space; the Agreement on the Rescue of Astronauts, while not defining the term, refers consistently to "personnel of a spacecraft." Applying this meaning, the only new obligation imposed under the moon treaty would be the duty to warn of phenomena in outer space that would endanger humans who are not associated with a space-craft—extending possibly to humans on earth. This modification is insignificant because it is unnecessary; the objective of safeguarding human life in outer space (or on earth) is shared by all nations, and it is difficult to imagine an instance where one State would not take the simple and humanitarian step of warning others of danger.

The specific obligation to inform of any indication of organic life under the moon treaty is new, but the Outer Space Treaty imposes a general obligation on States Parties to inform the public "of the nature, conduct, locations and results" of their activities in outer space and on celestial bodies (Article XI). This new provision in the moon treaty is thus insignificant because: (a) States Parties already have a general duty to disclose the discovery of organic life in outer space; and (b) it is inconceivable that a State discovering organic life in outer space would fail to disclose that fact to the public and scientific community at large.

—Obligation to safeguard human life and to accord to all persons on celestial bodies special Astronaut Agreement treatment regardless of the scientific or commercial character of their activities.

Response. The provision of the moon treaty to which the State Department refers is a beneficial change to existing international law, but the advantage is outweighed by the costs of the other provisions.

Article X, paragraph 1, of the moon treaty obligates States Parties to "safeguard the life and health of persons on the moon." On the other hand, Article V of the Outer Space Treaty directs that States Parties shall "render * * * all possible assistance in the event of accident, distress or emergency landing" to the "astronauts" of other State Parties; and that same article requires the astronauts of one State Party to "render all possible assistance" to other astronauts. Article X of the moon treaty would also extend these provisions to "any person on the moon." Thus, the moon treaty would strengthen both the nature of the obligation (i.e., adopting measures to safeguard life, as distinguished from rendering assistance in the event of distress, etc.) and the scope of the obligation (i.e., to any person on the moon, as distinguished from an astronaut).

These changes to existing law, while beneficial, are nevertheless of little practical importance. First, the extension of the scope of the obligation to non-astronauts on the moon is not timely; the day when humans will be present on celestial bodies in life-systems independent of a space-craft is far into the future. Second, the changes in both the scope and nature of the objective are unnecessary, since these provisions only restate what are humanitarian standards of conduct for all nations. Third, the provision in Article X, paragraph 1, of the moon treaty which would require adopting "all practicable measures to safeguard" life can be read as limited by the second sentence's cross-reference to existing obligations in the Outer Space Treaty and Return of Astronauts Agreement.

The second part of the State Department argument erroneously implies that astronauts engaged in commercial activities under the Outer Space Treaty or the Return of Astronauts Agreement would not be entitled to the same protection as those engaged in scientific activities. In fact, the Outer Space Treaty does not even attempt to define the term "astronaut," merely describing such persons as "envoys of mankind." Similarly, the Return of Astronauts Agreement accords all "personnel of a spacecraft" identical treatment in the situations it covers—regardless of their purpose.

—Obligation to offer shelter to persons in distress.

Response. The provision of the moon treaty to which the State Department refers makes only minor changes to existing international law.

Article X, paragraph 2, of the moon treaty merely elaborates the basic obligation found in Article V of the Outer Space Treaty for States Parties "to render all possible assistance" to astronauts in distress, and for the astronauts of one State Party to assist those of another.

Similarly, Article 3 of the Return of Astronauts Agreement requires States Parties who are in a position to do so assist in search and rescue operations for personnel of a spacecraft who need assistance in any place beyond the territory of a soverign State; and Article 4 requires the prompt return of such personnel to "representatives of the launching authority," or home state, when they are found in a place beyond State territorial jurisdiction as a result of "accident, distress, emer-

gency or unintended landing." [1] Presumably, these acts would require providing shelter.

Here again, the importance of this elaboration depends on the definition of the term "astronauts." Overall, it is not an important addition to international law because: (*a*) the time when persons will be present in space who are not deemed to be astronauts is so far into the future; and (*b*) a treaty obligation to act in a humanitarian manner is unnecessary.

—Right to emergency use of celestial body facilities of other parties if necessary to save lives.

Response. The provision of the moon treaty to which the State Department refers makes only minor changes to existing international law.

Article XII, paragraph 3, is a new concept in the body of outer space law—it gives a State Party the right to use another's "equipment, vehicles, installations, facilities or supplies" in a life-threatening situation on the moon or on other celestial bodies. While the motivation underlying this provision is certainly laudable, the actual need for the change is muted by the likelihood that no State would object to the use of its property in outer space by others, where necessary to save life. In fact, the right to use another State's property for this purpose is really a corollary to the existing affirmative obligations on States Parties under the Outer Space Treaty and Return of Astronauts Agreement to render all possible assistance to astronauts in distress. (See discussion above.)

—Duty to notify in event of crash landings.

Response. The provision of the moon treaty to which the State Department refers closely parallels, and makes no significnt change to, existing international law.

While Article XIII of the moon treaty requires a State Party learning of a crash landing on the moon to inform both the launching State and the UN Secretary General, Article I of the Return of Astronauts Agreement requires a State Party learning of a crash landing in any "place not under the jurisdiction of any State" to inform both the launching State (or if unknown, the public) and the Secretary General.[2] Indeed, the Return of Astronauts Agreement imposes an even broader obligation by also requiring State Parties to give notice of situations of accidents or distress not involving crash landings.

—Duty to inform if mission locations may overlap.

Response. The provision of the moon treaty to which the State Department refers closely parallels, and makes only minor changes to, existing international law.

Article XI of the Outer Space Treaty already obligates State Parties to inform of the nature, conduct and locations of their activities in outer space, including those on celestial bodies. Article IX of the same treaty requires States Parties to consult where the activity of one "would cause potentially harmful interference" with the activities of another. Accordingly, the provisions of Article V, paragraph 2, of the moon treaty (requiring a State Party aware that another State intends to operate in the same area, or in the same orbit or trajectory to or around the moon, to inform the other State of "the timing of and plans for its own operations") add little to existing obligations. Indeed, they only differ from the provisions of the Outer Space Treaty in that they make the seriousness of the potential interference irrelevant.

2. Promoting exchange of scientific results of celestial body activities

Response. The provision of the moon treaty to which the State Department refers is taken practically *verbatim* from an existing treaty. If anything, the moon treaty has disadvantageous implications on this point.

Article I of the Outer Space Treaty already provides that "[t]here shall be freedom of scientific investigation in outer space, including the moon and other celestial bodies."

Article VI, paragraph I, of the moon treaty could even be viewed as an attempt to restrict freedom of scientific research by providing that "[t]here shall be freedom of scientific investigation on the moon *by all States Parties*" [italics added], since Article I of the Outer Space Treaty recognizes the right of all States to conduct scientific research freely. Although the Outer Space Committee agreed that the moon treaty would not derogate from the Outer Space Treaty, this apparent attempt to narrow the right of scientific research on the moon to States Parties—in contrast to provisions of the Outer Space Treaty—is still very presumptuous, given that the moon treaty may enter into force with only five ratifications.

—Requiring notification of celestial body activities and their results on mission completion or every 30 days for long duration activities.

---

[1] It is clearly possible to interpret the term "place not under the jurisdiction of any State" in the Return of Astronauts Agreement to apply to outer space, including on celestial bodies.

[2] See previous footnote.

Response. The provision of the moon treary to which the State Department refers closely parallels, and makes only minor changes to, existing international law.

Article V, paragraph 1, of the moon treaty essentially tracks the obligations imposed under Article XI of the Outer Space Treaty and Article IV of the Registration Convention, even though it contains certain new, specific provisions concerning the duty to inform other States of activities on celestial bodies. Article XI of the Outer Space Treaty provides that States Parties "agree to inform" the public "to the greatest extent feasible and parcticable, of the nature, conduct, locations and results" of their outer space activities. Article IV of the Registration Convention requires launching States to inform of "basic orbital parameters" and the "general function" of their space objects. Article V of the moon treaty also limits the duty to inform with the phrase "to the greatest extent feasible and practicable," thereby qualifying the rest of that paragraph. The only new provisions on this subject in the moon treaty, therefore, are the provisions establishing special 30 day reporting requirements for longer missions—a mere elaboration of existing reporting requirements.

—Requiring reports of discovery of areas of special scientific interest; possibility of designating such areas as scientific preserves.

Response. The provision of the moon treaty to which the State Department initially refers closely parallels existing international law; the second provision to which it refers is merely hortatory.

The provision in Article VII, paragraph 3, of the moon treaty requiring States Parties to report "concerning areas of the moon having special scientific interest" is—like the provision in Article V discussed on the preceding page—merely a more specific formulation of the obligation in Article XI of the Outer Space Treaty to inform of the results of activities on the moon.

The provision in Article VII, paragraph 3, of the moon treaty which states that the purpose of this reporting requirement is "in order that, without prejudice to the rights of other States Parties, consideration may be given to the designation of such areas as international scientific preserves for which special protective arrangements are to be agreed in consultation with the competent organs of the United Nations" does not impose any binding obligation. It is merely hortatory and thus has little practical value.

—Obligation to take measures to protect the balance of celestial body environments.

Response. The provision of the moon treaty to which the State Department refers is a beneficial change to existing international law, but the advantage is outweighed by the costs of other provisions.

While Article VII, paragraph 1, of the moon treaty provides that States Parties "shall take measures to prevent the disruption of the existing balance" of the environment of celestial bodies, Article IX of the Outer Space Treaty already establishes a comparable obligation. The latter provides that "States Parties shall * * * conduct exploration of [celestial bodies] so as to avoid their harmful contamination * * * and, where necessary, shall adopt appropriate measures for this purpose."

The new provisions in the moon treaty are an improvement because: (a) they slightly strengthen the nature of the duty (i.e., from adopting necessary and appropriate measures to taking measures); and (b) they cover a broader range of effects (i.e., disruption of the existing balance through adverse changes, harmful contamination "or otherwise"). These improvements do not, however, justify the costs incurred by other provisions of the moon treaty, since the basic obligation to protect the environment of celestial bodies already exists under the Outer Space Treaty.

—Duty to consider the possibility of sharing samples with the international scientific community.

Response. The provision of the moon treaty to which the State Department refers is merely hortatory.

Article VI, paragraph 2, of the moon treaty provides, in part, that "States Parties shall have regard to the desirability" of sharing moon samples with others. Clearly, the provision creates no specific enforceable obligation; it differs little in effect from the provisions of Article IX of the Outer Space Treaty establishing a principle of "co-operation and mutual assistance" for outer space activities.

—Desirability of exchanging scientific and other personnel on celestial body missions.

Response. The provision to which the State Department refers is merely hortatory.

Article VI, paragraph 3, of the moon treaty provides that the "States Parties agree on the desirability" of exchanging personnel on missions. Like the provision in paragraph 2 of the article discussed on the preceding page, this language creates

no specific, enforceable obligation. Moreover, it is also duplicative of existing language in Article I of the Outer Space Treaty requiring States to "facilitate and encourage international cooperation in [scientific] investigation."

—Duty to notify of any placement of radioactive materials on a celestial body.

Response. The provision of the moon treaty to which the State Department refers is a beneficial change in existing international law, but the advantage is outweighed by the costs of other provisions.

Article VII, paragraph 2, of the moon treaty requires States Parties "to the maximum extent feasible [to] notify [the Secretary General] in advance of all placements by them of radioactive materials on the moon and of the purposes of such placements," Article XI of the Outer Space Treaty requires States Parties to inform of the nature and location of their activities in outer space; Article V of that treaty requires States Parties to disclose "phenomena" that would endanger astronauts; and Article IX requires States Parties to adopt necessary and appropriate measures to avoid harmful contamination of celestial bodies. Thus, while a specific reference to radio-active materials disposal and storage in the moon treaty would be a material addition to the body of space law, these existing obligations mean that the improvement does not justify the costs of the moon treaty.

—Confirming right to collect and remove samples for scientific investigation and to use celestial body substances to support scientific missions.

Response. The provision of the moon treaty to which the State Department refers closely parallels existing international law.

International law is established not only through treaty-making but also through state practice. As the State Department itself recognizes in its use of the term "confirming", the right to collect samples for scientific purposes has been exercised by States without significant challenge since the Apollo mission landed on the moon. Thus, the provisions of Article VI, paragraph 2, of the moon treaty are merely a codification of customary international law on this particular point.

3. Enchancing opportunities for exploration, research and exploitation of celestial body natural resources

—Recalling the UN Charter's goal of promoting higher living standards.

Response. The provision of the moon treaty to which the State Department refers is merely hortatory.

Article IV, paragraph 1, of the moon treaty provides that "[d]ue regard shall be paid" to the need to promote higher living standards "in accordance with the Charter of the United Nations." Thus, the provision establishes no specific, binding obligation. Moreover, since the general goal of improving living standards is already contained in the UN Charter, a reference to that identical goal in the moon treaty is completely unnecessary.

There is even a possibility that the provision to which the State Department refers may be detrimental, because it follows a sentence which declares that the "exploration and use of the moon shall be the province of all mankind." It therefore might be viewed as an elaboration of the meaning of the phrase "province of all mankind" which, until now, has been undefined in international space law. The selective incorporation of this particular principle from the Charter (i.e., promoting higher living standards) would thus be seen as superimposing special preferences for developing countries onto the "province" concept.

—Obligation to take measures to protect celestial body environments (see 1 [sic:2], above).

Response. The provision of the moon treaty to which the State Department refers is a beneficial change to existing international law, but the advantage is outweighed by the costs of other provisions.

This alleged benefit is identical to that commented upon above.

—Duty to accord Astronaut Agreement treatment to all personnel, including those engaged in exploration (see 1, above).

Response. The provision of the moon treaty to which the State Department refers closely parallels, and makes only minor changes to, existing international law.

This alleged benefit is identical to that commented upon above.

—Confirming the right to land objects on celestial bodies.

Response. The provisions of the moon treaty to which the State Department refers closely parallels existing international law.

Article I of the Outer Space Treaty provides that celestial bodies "shall be free for exploration and use by all States" and that "there shall be free access to all areas of celestial bodies." State custom and practice has expanded the "open to use" and "free access" doctrines so as to grant States the right to land objects on the moon, and presumably on other celestial bodies. Thus, Article VIII, paragraph 2(a), of the moon treaty is unnecessary, since it does not significantly alter existing internation-

al law on this point. State Department recognizes this fact by its use of the term "confirming."

—Confirming the right to place personnel and equipment on and below the surface of a celestial body, and to move them about freely.

Response. The provision of the moon treaty to which the State Department refers closely parallels, existing international law.

The provisions of Article VIII, paragraph 2, describing the right of free access on celestial bodies—like those discussed on the preceding page—merely re-state existing international law, established in Article I of the Outer Space Treaty and elaborated through State custom and practice. Here again, State Department recognizes this fact by its use of the term "confirming."

—Right to be free of interference from other parties.

Response. The provision of the moon treaty to which the State Department refers may be a beneficial change in existing international law, but the advantage is outweighed by the costs of other provisions.

Article VIII, paragraph 3, of the moon treaty provides "[a]ctivities of States Parties * * * shall not interfere with the activities of other States Parties on the moon." This language significantly strengthens the noninterference provisions of Article IX of the Outer Space Treaty, which require States Parties to pay "due regard to the corresponding interests of all other States Parties" and consult when their activities "could cause potentially harmful interference" with other States Parties' activities.

An absolute prohibition on interference, however, is not inherently an advantage to the exploration and use of natural resources. In this case, since all States Parties have apparently equal rights to explore and use the same resources, the ban on interference does not promote development.

What is first required to give meaning to a prohibition on interference—but not provided here—is some determination as to priority of rights.

—Right to obtain return of equipment that has gone astray.

Response. The provision of the moon treaty to which the State Department refers closely parallels, and makes only minor changes to, existing international law.

Article XII, paragraph 2, of the moon treaty merely provides that "[v]ehicles, installations and equipment or their component parts found in places other than their intended location shall be dealt with in accordance with Article V" of the Return of Astronauts Agreement. The latter provision directs that "objects launched into outer space or their component parts found beyond the territorial limits of the launching authority" shall be returned upon request of the launching State.

The duty to return is stated more generally in Article VIII of the Outer Space Treaty, where it applies to objects or their component parts "launched into outer space, including objects landed or constructed on a celestial body." Whether or not the existing duty to return extends to objects manufactured in space and not launched therefore depends on the interpretation of this quoted phrase in the Outer Space Treaty. In any event the possible expansion of the obligation in the moon treaty is minor.

—Requirement that other countries confine their activities and facilities to those areas of a celestial body necessary to specific missions.

Response. The provision of the moon treaty to which the State Department refers may be a beneficial change to existing international law, but the advantage is outweighed by the costs of other provisions.

Article IX, paragraph 1, of the moon treaty directs States Parties "establishing a station" to "use only that area which is required for the needs of the station." Since paragraph 2 of the same article directs that stations "be installed in such a manner that they do not impede the free access to all areas of the moon" of other States Parties, it is unclear what is meant in paragraph 1 by the term "establishing." In any event the principle of non-appropriation in both the moon treaty and the Outer Space Treaty would seem to preclude any one State Party from attempting to exclude others from use of an area of a celestial body. In short, this provision in the moon treaty is probably superfluous.

The possible usefulness of this particular provision in the context of a resource development regime could be the limitation it might impose on the size of resource deposits claimed to those areas actually worked or exploited. Since national claims to any part of the moon or its resources in place are prohibited by Article XI of the treaty, however, the alleged benefit raised by the State Department is made wholly meaningless.

—Prohibiting foreign claims of rights to celestial body areas not actively being worked.

Response. The provision of the moon treaty to which State Department refers appears irrelevant to the benefit alleged.

This alleged benefit appears to be merely a restatement of the alleged benefit commented upon on the preceding page. Since Article XI of the moon treaty and Article II of the Outer Space Treaty prohibit "foreign claims" to celestial bodies, the point made by the State Department appears to be irrelevant.

—Declaration that celestial bodies and their natural resources are the common heritage of mankind, meaning that the parties to the Celestial Body Agreement have an interest in exploitation on celestial bodies which interest is to be defined by free negotiation at a conference of parties to be called in the event exploitation proves feasible. Note: Any eventual regime will bind only those countries that accept it. Acceptance of a regime by the United States will require advice and consent.

Response. The provision of the moon treaty to which State Department refers is a detrimental change to existing international law.

Article XI, paragraph 1, of the moon treaty declares celestial bodies and their resources to be "the common heritage of mankind". This phrase has a definite legal and political meaning that is directly inconsistent with United States interests in the commercial development of outer space resources.

State Department's argument that the future regime to be negotiated will only bind the U.S. if we ratify the later agreement ignores practical considerations. If we ratify this moon treaty, then we will be obligated under Article XI, paragraph 5, to "establish" a resource exploitation regime. If we then reject the subsequent regime the majority of States Parties negotiate, the political pressure on the U.S. to go along will be tremendous. No commercial entity will be able to afford to stay outside the new regime.

—Duty to inform the scientific community to greatest extent feasible and practicable of natural resources discovered on a celestial body.

Response. The provision of the moon treaty to which the State Department refers is a detrimental change to existing international law.

Article XI, paragraph 6, of the moon treaty does require States Parties to disclose resources discovered on celestial bodies. This provision is arguably only a slight expansion of the existing obligation under Article XI of the Outer Space Treaty to inform of the results of outer space activities. To the extent the moon treaty makes the disclosure obligation more specific with respect to resources, however, it is probably detrimental to U.S. interests in commercial resource development. The reason is that mandatory disclosure of resource discoveries is a disincentive to private exploration for resources for commercial purposes.

—Denying any moratorium on exploitation in the period before a mutually acceptable treaty negotiated at a regime conference enters into force.

Response. The provision of the moon treaty to which the State Department refers is a detrimental change to existing international law.

The State Department erroneously argues that the provisions of paragraphs 4, 5 and 8 of Article XI of the moon treaty make clear that there is no moratorium on exploitation of resources pending the establishment of the new regime. Exactly the opposite is true. In the absence of the moon treaty, existing international law cannot be construed to impose any moratorium on resource development.

—Establishing industry-supportive objectives of exploitation, to be spelled out by mutual agreement when a regime conference is held:

—Orderly and safe development of celestial body resources.

—Rational management of resources.

—Expansion of opportunities in use of resources.

—Equitable sharing among parties of resource benefits with special consideration for developing country needs and space power investments.

Response. The provisions of the moon treaty to which State Department refers are detrimental changes in existing international law.

The objectives for a subsequent resource regime set forth in Article XI, paragraph 7, are demonstrably anti-development, and not "industry-supportive" as State Department claims. Each of these four objectives is a diplomatic code-word for a basis system of resource exploitation antithetical to private investment.

—Right to obtain meaninful consultations with any party whose celestial body activities may jeopardize U.S. plans and activities.

Response. The provision of the moon treaty to which State Department refers is a beneficial change to existing international law; the advantage gained, however, is outweighed by the overall costs of the treaty.

Article XV, paragraphs 2 and 3, of the moon treaty detail a procedure of mandatory State Party consultations and Secretary General mediation in disputes arising under the treaty. While this procedure is a useful improvement to the present provisions for voluntary consultations where activities in outer space may cause potentially harmful interference with each other (Article IX of the Outer Space

Treaty), it naturally does not provide for any means of binding dispute settlement. Thus, it is of minimal importance.

—Recognition that a protective special liability regime governing celestial body activities may need to be negotiated.

Response. The provision of the moon treaty to which State Department refers is merely hortatory.

Article XIV, paragraph 2, of the moon treaty merely states that States Parties "recognize" that a later agreement on liability may need to be negotiated. It therefore makes no meaningful headway in the field of liability. Moreover, this provision of the moon treaty does not suggest any particular content of a special liability regime, "protective" or otherwise.

[The following information was subsequently received for the record:]

Questions of the Committee and the Answers Thereto

Question. You heard the testimony on Tuesday (July 29, 1980) in which it was said that according to international law (customary and codified) the interpretation of treaties depends on the negotiating history of the treaty, that uncontradicted unilateral statements of interpretation made during the course of the negotiations or before being approved by the United Nations General Assembly are part of that negotiating history. It was then stated that such uncontradicted statements by the United States and the defeat of specific proposals by other delegations conclusively establishes as a matter of interpretation of the Moon Treaty that:

1. A state may remove and exploit natural resources from celestial bodies.
2. There is no moratorium established by the Treaty on the exploitation of natural resources either pre-regime or if a state chooses not to become a party to the Treaty establishing such a regime.
3. The Treaty does not apply to trajectories and orbits of space objects in earth orbit only or trajectories of space objects between the earth and earth orbit.
4. The United States can carry out the exploration of the natural resources of celestial bodies through use of public or private entities.

As a legal scholar familiar with international law, what is your view of this interpretation of the Treaty?

Answer. Right to exploit.—My view on the legal interpretation of the Moon Treaty with respect to the first and second statements are included cryptically in a footnote in my written testimony. I will elaborate these points.

Clear and unequivocal negotiating history can certainly be used to interpret ambiguous provisions in treaties. In this case, however, the treaty language is less ambiguous than we might wish and the negotiating history is definitely unclear.

No provision of the Moon Treaty expressly recognizes the present rights of states to "exploit" lunar resources. The only references to exploitation appear in Article XI, and a right to exploit cannot be derived from the 1967 Outer Space Treaty, because the latter treaty does not use the term. As a matter of treaty interpretation, the present rights of states to "explore and use" lunar resources recognized in the Moon Treaty cannot be deemed to incorporate the right to exploit, since the specific word "exploitation" also appears in the Treaty. The only possible reading of the treaty which permits exploitation prior to the establishment of a new regime under paragraph 5 of Article XI depends upon paragraph 8's reference to "[a]ll activities with respect to the natural resources of the moon shall be carried out * * *." The provision is ambiguous as to whether the phrase "shall be" is in the future or present imperative tense. It is this same ambiguity which, in the context of the 1970 Seabed Declaration, permitted many international legal scholars to argue that unilateral exploitation activities were prohibited.

As a matter of strict interpretation of the language of the treaty, then, there is room for doubt about whether a State may "exploit natural resources" under "1" above and whether a moratorium on exploitation is contained in the treaty under "2" above. This interpretation based on the treaty's language is bolstered by two additional provisions. Article XI, paragraph 5, of the Moon Treaty obligates States Parties "to establish an international regime, including appropriate procedures, to govern the *exploitation* of the natural resources of the moon as such exploitation is about to become feasible" [italics added]. One clear reading of this language is that the new regime must precede actual exploitation. Moreover, Article VI, paragraph 2, the one provision which recognizes the present right to use resources, is limited to use for scientific investigations and, by negative inference, prohibits use for commercial purposes.

As noted in the question reproduced above, some treaty proponents have attempted to bolster their argument that there is no moratorium on exploitation with

reference to the negotiating history, citing: (i) the failure of the Committee on the Peaceful Uses of Outer Space (COPUOS) to approve express proposals to include a moratorium and (ii) "uncontradicted" unilateral statements by the United States supporting their interpretation. It is important to clarify for the record that the negotiating history on this point is not unambiguous. While the U.S. Representative in the UN Special Political Committee made clear our official interpretation on the moratorium point, the Indonesian Representative in that same body said the following: "The Draft treaty would protect the rights of all States to their share of space resources and assured developing nations of their share of such resources by the provision to set up an international regime to govern the exploitation of natural resource when such exploitation becomes feasible. In the meantime . . . States retained the right to conduct scientific investigations of the moon but committed themselves to report their findings to the Secretary General and to the international community."

Together with the important ambiguity described above which COPUOS chose to include in the treaty and which could be viewed as a substitute for express moratorium proposals, this record certainly provides scope for differing legal interpretations.

In any event, legislative history is only useful when, and if, there are impartial judicial proceedings and there is a preliminary finding of ambiguity on the face of the treaty. Bearing in mind the international adjudicatory process, this would seem a slender reed.

Trajectories and orbits.—With respect to "3" above, the COPUS Report, approved by consensus, states the treaty drafters' intentions in clear terms. To my knowledge, this statement is not weakened by other items in the negotiating history, and the statement by the United States Representative in the UN Special Political Committee elaborating this understanding to its logical conclusion is uncontradicted.

Exploration by private entities.—Article XIV, paragraph 1, of the Moon Treaty clearly contemplates the carrying out of "activities on the moon" by "non-governmental entities." Since States Parties have present rights to engage in exploration under this treaty and the 1967 Outer Space Treaty, there appears to be little dispute about the effect of the Moon Treaty with respect to "4" above. A definitive answer would require detailed review of the negotiating history in order to determine whether any element contradicated the view stated in item "4."

Question. Mr. Hosenball, using the analogy of public lands said: "The filing of the location of a claim does not transfer ownership of the public land to the claimant and similarly under the Moon Treaty the use and occupancy of an area of the moon does not transfer ownership of that area of the moon. The non-interference provision of the treaty does in effect give the state party or private enterprise party, acting under authority of the state party, the equivalent of an exclusive privilege to mine the claim. These treaty provisions also limit the area that can be mined to that which is required to conduct the mining operations. Thus the Moon Treaty does contribute to the continuing development of space law and does provide more certainty than currently exists under the 1967 Outer Space Treaty." What is your view of this interpretation of the Treaty by analogy with mining operations on public lands?

Answer. As elaborated in the separate statement I have submitted for the record in response to Senator Schmitt's request, I believe the public lands analogy is a poor one. Under the 1872 mining law, the discoverer of a mineral deposit can obtain exclusive rights—ownership—of those minerals in place by properly filing and maintaining a claim. There is no provision in the Moon Treaty pursuant to which States may now acquire exclusive rights to exploit particular resource areas. Indeed, Article XI, paragraph 3, expressly prohibits acquiring property rights in natural resources in place.

I do not agree that the ban on interference in Article VIII, paragraph 3, provides the first entity on the site the exclusive right to exploit. The obligation of non-interference applies equally to the first State to arrive and to any newcomers. This same principle has been traditionally used in maritime law to epitomize non-exclusive concepts.

I agree that the principle in Article IX, paragraph 1, which limits the size of areas needed for stations could prove a useful foundation for requiring in a later regime that resource claims must be diligently worked. Standing by itself, however, it is only a minor contribution to the body of space resource law.

Question. What is your view as to a future agreement dealing with the international regime being a treaty and therefore having to be sent to the Senate for advice and consent to ratification if signed.

From a practical point of view, if the Senate should give advice and consent to ratification of the Celestial Bodies Agreement could the Executive Branch at some

future time conclude an Executive Agreement establishing an International Regime?

Does the Celestial Bodies Agreement make it legally certain that the Agreement does not apply to space activities in earth orbit other than space activities on the moon or around the moon?

Answer. Executive agreement.—From a practical point of view, I doubt that the second lunar resource agreement envisioned under Article XI of the Moon Treaty would fail to be submitted to the Senate for its advice and consent. To develop a resource regime, such an agreement would inevitably impose important new international obligations upon the United States. In light of the probable substance of these obligations, any Administration would be very unlikely to attempt to implement the agreement without Senate advice and consent, whether or not it could be classified as a "treaty" for the purpose of United States Constitutional requirements.

Activities in Earth orbit.—The understanding on this point approved by consensus in the COPUOS Report and expressly incorporated by reference in the General Assembly resolution opening the Moon treaty for signature is probably adequate assurance that the treaty will not be interpreted as applying to activities in earth orbit only. One would have preferred that this point be made in the language of the treaty.

Question. In your statement (Page 5) you say, "Unlike the field of space communications * * * where the resource is technology and space itself, the Moon treaty concerns raw materials in space * * *." I was under the impression that the principal resources of space communications are two: The electromagnetic frequency spectrum and the geostationary orbit. Both are very limited resources, whereas the raw materials in space are out there in enormous quantities. The only essential limitation on the amount is man's capability—both technical and economic—to extract and transport them to a place where they can be used. Also, in the recent WARC 1979 held under the auspices of the ITU, where the one-country-one vote rule applies, the U.S. did quite well in getting frequency assignments for services important to the United States. So I don't understand your point there. Could you elaborate please.

Answer. I agree that in today's political and technical environment, the electromagnetic spectrum and geostationary orbit have come to be seen as scarce resources. At the time that INTELSAT was negotiated, however, this perception did not exist. It was precisely because the communciations uses of space appeared to be limitless—and because developing countries had not yet become collectively a powerful voice in UN political forums—that agreement could be reached on the kind of international regime developed under Intelsat.

There is today a pervasive viewpoint in international political and economic negotiations (and in the domestic sphere, too) which denies even the possibility that certain natural resources are of such enormous magnitude that they should be freely available. I am convinced that for the foreseeable future, international negotiators will not be in a position to ignore this viewpoint, whether or not it is consistent with the current understanding of reality.

With respect to the apparent United States success at WARC 1979, I would comment, first, that United States negotiators at that conference were negotiating from a position of comparative strength; they have not to my knowledge conceded to the Third World the privilege of common consent inherent in the common heritage principle. Second, it is also important to recognize that key issues of principle regarding the use of the geostationary orbit for space communications have been deferred for a special "Space WARC" scheduled for 1984. If history is a guide, United States negotiators may well submit to continuing Third World pressure to modify the legal regime for space communications to a common heritage-type approach, in the absence of persistent Senate counter-pressure.

Senator STEVENSON. Our next witness is Mr. Marne A. Dubs, chairman of the American Mining Congress Committee on Undersea Mineral Resources, and vice president of Kennecott Development Corp.

STATEMENT OF MARNE A. DUBS, CHAIRMAN, AMERICAN MINING CONGRESS COMMITTEE ON UNDERSEA MINERAL RESOURCES, AND VICE PRESIDENT, KENNECOTT DEVELOPMENT CORP.

Mr. DUBS. Good morning, Mr. Chairman. I will try to describe some of the more important meanings out of my testimony.

The American Mining Congress, recognizing the potential importance of minerals from new sources not yet fully explored by man have had an active Committee on Undersea Mineral Resources for many years now. We have concerned ourselves in this committee with the unraveling of the legal and political tangle that has in fact massively retarded the development of seabed resources. Even now, although we have been encouraged lately by the enactment of ocean mining legislation, we are looking with great concern at the Sea Treaty negotiations just reopened this week in Geneva. From our point of view it's difficult to imagine how a satisfactory Sea Treaty regarding seabed resource exploitation can result from the present draft treaties.

We are disturbed because we now see history repeating itself with respect to extraterrestrial materials—both with respect to understanding the potential importance of these materials with commercial technology undeveloped and economic resources unidentified, and with respect to the proposed underpinnings of a legal regime for space.

To look at the past history, we have to look at the situation with respect to the Law of the Sea prior to the adoption of the United Nations in 1970 of the "Declaration of Principles."

At that time there was no understanding by our Government, both executive and legislative, or by the industrial community generally, of the importance of seabed resources or of the commercial practicability of their extraction. The words of the few industrial and academic pioneers were largely ignored as the words of impractical dreamers and the words of idealists such as Dr. Arvid Pardo, extolling the riches of the deep seabed, were discarded as unreal.

Accordingly, it appeared quite in order to our foreign policy law of the sea specialist to sacrifice the deep seabed for other goals better understood and defined at that time.

Extraterrestrial resources are, if anything, in a more precarious position to resist attack and abandonment by the political realists of today. It is not easy to attach a dollar and cents sign to space resources. It is not possible to outline practical mining methods that are economically viable. I cannot tell you what minerals may be mined, at what cost, and on what schedule. Thus, we are not able to effectively respond to the committee's desire to quantify the participation of U.S. industry in exploitation of extraterrestrial resources, the state of technology, and the cost and schedule for such exploitation.

Nevertheless, Mr. Chairman, we must be cautious in writing off the value of resources that are undoubtedly vast—scientific literature makes that abundantly clear—because of the fact that we have not yet explored and identified specific mineral deposits for exploitation nor assembled the prototype equipment for mining. Clearly these resources are in our future. It is wise to contemplate

the possibility that the resources will be mined and used both on Earth and extraterrestrially to bring untold benefits to our society in ways now only dimly imagined.

Mr. Chairman, in brief, let us not again use ignorance as a tool to write off the resources from extraterrestrial sources. This is what we did in the Law of the Sea Treaty.

To further examine our theme of repeated history, we must go directly to the principle of the "common heritage of mankind." The phrase "common heritage of mankind" was discussed in the United Nations prior to 1970, but in any event the diverse and radical meaning attached to this phrase was largely unappreciated by the developed nations and they unfortunately agreed to its adoption in the "Declaration of Principles."

There were some who were disturbed by the "common heritage" concept. They saw the dangers inherent in the phrase. In fact, our negotiators even while adopting the Declaration of Principles made a statement saying that the meaning of the phrase would be in accordance with the treaty to be negotiated. This is a classic example of a declaration by our negotiators that in fact was not given any meaning by anyone until subsequently in the Law of the Sea negotiations.

So now history repeats itself. The negotiators of the Moon Treaty, who appear not to have ever heard of the Law of the Sea, assure us that the phrase in the Moon Treaty, "The Moon and its natural resources are the common heritage of mankind," entails no specific obligation on states except the commitment to engage in good faith negotiations on a mutually acceptable international regime for exploitation. This is the same assurance we received in 1970 from the Law of the Sea negotiators. We know where "common heritage" has taken the Law of the Sea Treaty on the basis of a U.N. Resolution on Common Heritage. Where will a signed treaty—perhaps to enter into force for most of the world—take us?

The path can be clearly seen by looking at the Law of the Sea negotiation. We have been close observers of these negotiations because it was important to deep seabed mining and we think our experience would be useful.

Clearly, as a result of 10 years of negotiating effort at the Law of the Sea Conference, the international community has developed numerous treaty texts which give meaning to the originally vague "common heritage" principle. This effort is all the more significant because, during the same time span, the Third World incorporated the "common heritage" principle into its program for a new international economic order. For the majority of nations, "common heritage" has come to symbolize a system in which complete international control over access to, and the disposition of, important natural resources is exercised so as to effect the transfer of wealth, technology, and political control from the industrialized countries to the developing countries. This is clearly seen in the ICNT provision to the Law of the Sea text. They have been elaborated in great detail.

Now in order to induce private investment in resource extraction projects involving the development of high technology, a regime must guarantee the investor the exclusive right to exploit and

utilize resource deposits he has discovered and explored; not impose conditions which unreasonably restrict profitability or technological and managerial initiative; and afford long-term security. In contrast to these requirements, the deep seabed regime now set forth in the Informal Composite Negotiating Text, Revision 2, has the following characteristics:

No state or private company has assured access to deep seabed resources;

Private companies which obtain contracts for deep seabed mining will be required to pay a significant share of their profits to the International Seabed Authority and to transfer their technology;

They will also have to compete—a point that has not been brought up—with a heavily subsidized international public mining company, the Enterprise. Their own governments will be providing these subsidies;

Development of deep seabed resources will be artificially restricted by a system of production controls designed to give maximum competitive protection to developing country producers of the same minerals on land;

No private company will be completely assured of the security of investments made in deep seabed mining, since the system of exploitation will be administered by an International Seabed Authority whose basic policies and politico-economic decisions are made by a one-nation-one-vote assembly controlled by developing countries. Such a policymaking apparatus is considered by most nations to be essential to the fulfillment of the "common heritage" philosophy.

As you know, the United States has been prepared to accept a deep seabed regime with these characteristics in order to obtain international agreement on a wide variety of ocean law questions perceived as important to our national interest. Whether U.S. private investment will ever occur in deep sea mining under the treaty depends largely upon the extent to which the draft treaty texts are further improved and refined, and an acceptable outcome is not assured at this time.

While the common heritage doctrine has been most fully elaborated at the Law of the Sea Conference, the Third World has attempted to apply the concept to other international resources, for example, the mineral resources of the Antarctic, the radio spectrum, and high technology. To our knowledge, the Moon Treaty represents the first instance in which common heritage has been included as a legally binding principle in a law-making treaty opened for signature, whose decisions cannot be questioned by any country. I believe if we sign that treaty, for example, that it would seriously interfere with our remaining arguments on the Law of the Sea Conference as far as negotiating a more acceptable agreement. Some say that the Law of the Sea experience will not be automatically transferable to the context of celestial body resources, however, this seems inconceivable to me, and it would apear to me that the political and economic value of the "common heritage" doctrine formulated in the Law of the Sea will be clearly translated over into this treaty.

Now another point I would like to make is that the political risk that a celestial body resource agreement will follow the Law of the Sea experience is likely to be compounded by the risk that most

nations will interpret the common heritage principle as mandating a moratorium on commercially oriented resource activities until the subsequent regime is agreed and in place. For those countries, common heritage is synonymous with common property; and they believe that common property resources are owned by the entire community and that no country or company can remove such resources without the permission of every member of the community. In fact, the United Nations adopted a resolution declaring a moratorium on the exploitation of the deep sea until the treaty was in place. So I think that my concern that acceptance of common heritage will create a moratorium is very real, and in the case of the Law of the Sea Treaty the moratorium was based not on a signed treaty but was based on a United Nations resolution.

There are, of course, sound reasons why an international agreement governing resource activities on the Moon and other celestial bodies may be desirable. To serve as a suitable basis for future private investment, however, such an agreement should:

Guarantee States and their companies unrestricted rights to explore for, exploit, and use space resources;

Allow each State to establish and enforce the basic terms and conditions governing such activities;

Create mechanisms for international decisionmaking which give those countries with an economic stake influence commensurate with their interests. Incidentally, this mechanism is far from achievement in the Law of the Sea Treaty. As has been mentioned, the Law of the Sea Treaty has an assembly and a council. The council is presumed to be the body where the States' interest would be looked out for and yet in the draft text the United States is not even assured of a seat on the council of the Seabed Authority.

Finally, a satisfactory treaty would have to establish agreed and effective procedures for the settlement of disputes.

We do not believe that unilateral understandings or reservations by the United States to the Moon Treaty can convert it into an agreement that satisfies these criteria. The force of the "common heritage" doctrine will necessarily outweigh the effect of such unilateral assertions, which are not legally binding on other countries.

The United States depends on private enterprise to supply its resource requirements and develop new technologies which permit better utilization of those resources in a manner that advances the economic well-being of the Nation. If the resources of outer space are ever to be developed, private capital and initiative based in the U.S. industry will undoubtedly play a critical role.

It is our considered view, based on experience in the deep seabed minerals context, that U.S. signature and ratification of the Moon Treaty in its present form will create overwhelming legal and political uncertainties which preclude potential U.S. industry participation in space resource development. We are not aware of any national interest which would justify assuming the costs associated with the Moon Treaty. In our opinion, it would be tragic for the United States to jeopardize its future to an as yet unknown, economic interest in space resources by repeating the mistake which acceptance of the "common heritage" principle has proven to be in the Law of the Sea context.

We appreciate this opportunity to present our testimony before you this morning. I would be happy to answer any questions you may have.

Thank you.

Senator STEVENSON. Thank you, sir.

Do you agree also that the celestial bodies agreement is—or any agreement—is premature if it's in advance of the science and technology for the exploitation of extraterrestrial resources and precedes U.S. space policy, as Senator Schmitt said at our last hearing?

Mr. DUBS. I believe this agreement is premature. The form in which this agreement is cast will clearly discourage development of space resources. It would be far better to have defined a regime for the Moon and celestial bodies that treats the resources of space on the basis of their being accessible to all.

Senator STEVENSON. Senator Schmitt.

Senator SCHMITT. Thank you, Mr. Chairman.

I appreciate your testimony. Let me make sure that I understand what might be the investment potential for, say, a specific lunar resource such as titanium. The Apollo program was roughly a $20 billion effort, in dollars in those years, over about a 10-year span of time. Let's say that equates to a level of investment that might be required to establish a major mining operation on the Moon and refining operation but it would be carried out over a 20-year period and in those years it might be $50 billion, something like that, and that the return on investment until that 20-year period had run would be almost entirely from spinoff of the technologies and other things that were developed in the course of the engineering effort to create such an operation. But after about 5 years that return on investment might well be as much as 10 percent. We know from studies that the return on investment of the space program technologies has been quite great, $5 to $10 per dollar invested within 5 or 10 years, something like that, and that the basic technologies for producing titanium are fairly well understood. Inflatable shelters can be used as your basic plant. Hydrogen could be produced from the soil using heat oxygen from the rocks using heat with silicon and aluminum as byproducts, water and electricity from the recombination of hydrogen and oxygen is required. Fuel cells, iron and nickel can be extracted directly from the soils because they are there in their free state in the soils as particles. Conveyor systems are not particularly complex. We have already learned how to hermetically seal equipment on the Moon so it will operate more or less indefinitely.

Titanium can be produced from illanite through known processes and a fairly simply guided largely free return shipment back to Earth to a designated point is not something that would be extraordinarily expensive. In terms of energy, you're dealing with roughly a gravity sink with respect to Earth.

Now I describe all of that in some detail just to maybe make it a little bit clearer that we are not talking about something that's so farfetched if the right environment exists for it to happen.

Would you comment on what I'm saying?

Mr. DUBS. Yes. You're correct that it is not farfetched. In my view—and I'm not a space technologist myself—in my view, the

possibilities of mining and operating equipment on the Moon are very real and the real issues are not issues of technology but are issues of economics, and the question of economics now is going to depend on several kinds of things.

It's going to depend on the availability of both raw materials on Earth and power on Earth and at the same time will depend on what missions we see in space that will require materials not on Earth but in space.

If we consider, say, titanium, using your example on the Moon, an important element in producing metals, for example, is power. This is going way out into the future, certainly beyond the year 2000, the 21st century, but certainly power is very important. You know very well the difficulties and high cost of power on the Earth today, and yet on the Moon there may be opportunities for either atomic power or for solar power that are quite different than they are on Earth. It may be possible to process materials at relatively little power cost.

But from an industrial point of view, this has not really been examined in detail. It's primarily been examined at this stage from a space technology point of view.

Senator SCHMITT. Well, I think you have a slightly different view of what is going to happen. Your view may be more realistic, but it doesn't necessarily have to be the only view. Energy costs on Earth are high artificially. There are extraterrestrial resources of energy and once we start to tap those that price is going to stabilize or even go down. If we hadn't restricted the price of oil and gas for 25 years the price wouldn't be there today. It's only there because of the oil cartel. That's one of the myths we make public policy on these days and it's unfortunate and maybe that myth will gradually disappear.

In addition, if we look at the history of metal use in civilizations, we are finding that as our ability to concentrate energy is increased, we have moved in materials of the ionic bond strength of the metals, oxygen bond, up the scale. Aluminum now is a major component of our civilization which was not in previous civilizations.

If you start to look at titanium, you start to look at the possibility of that becoming the metal of the future even here on Earth, and it already is working its way into certain specialized uses.

So I'm not sure we're only thinking about titanium use in space or for power production.

Mr. DUBS. No. It could be used on Earth.

Senator SCHMITT. As we start to need titanium here on Earth, it may turn out that the extraction costs, once that initial investment is made, is going to be less on the Moon than it is here on Earth under the conditions we have today, particularly where at least for the industrialized work titanium resources may be restricted in terms of their access.

I hope that you and the American Mining Congress and others will realize that the scenario of mining the Moon is not as far-fetched as it is painted to be by some who would like us to just agree to this treaty for other political purposes not having to do with the realities of actually getting resources in space.

Let me also say that we know probably where we would go to mine, where there is 10 to 13 percent by weight already in deep pulverized soils of the Moon. I just happened to have been there myself and I know it is there. I mean I know the specific spot—Valley of Taurus littoral and the area surrounding Taurus littoral, where there is that kind of material.

Mr. DUBS. Let me comment on that, if I may, in this fashion, because it really is the central theme of my testimony—the theme I wanted to emphasize. That is this; that I use ocean mining as an example because in many ways ocean mining is a matter of high technology like the Moon. You walked on the Moon, but——

Senator SCHMITT. There are many similarities.

Mr. DUBS. But it's very unlikely that any of us will ever walk on the deep seabed.

Now back in the early 1960's when my company became interested in deep ocean resources, the degree of skepticism within the company and the degree of skepticism within industry in general, was greater than the degree of skepticism that may have been raised in the near utilization of Moon resources. It really is something that—the development—has to take place, and we are just at the beginning of looking at such developments.

So one of the points I want to make on the celestial body treaty is that it's easy for people to dismiss the practicality, the economic viability of mining in space, because the work has not yet been done. We haven't yet tackled it. There are only a few far-sighted people that are looking at it. I think for that reason we must treat the Moon and the celestial body treaty on the basis that the exploitation of the resources on the Moon and celestial bodies will occur. It's just a matter of time.

Senator SCHMITT. Technically, the ocean problem is more difficult because you're dealing with hundreds of thousands of atmospheric difficulties, whereas in space we had one atmospheric difficulty. It made it a lot easier.

Mr. DUBS. You're right. Technically, I can get electronics for space easier.

Senator SCHMITT. You don't have to worry about corrosion and things like that. Really space is easier and if you believe that I'll sell you some of that land on the Moon.

[The statement follows:]

STATEMENT OF MARNE A. DUBS, VICE PRESIDENT, KENNECOTT DEVELOPMENT CO., ON BEHALF OF THE AMERICAN MINING CONGRESS

My name is Marne A. Dubs. I am Vice President of the Kennecott Development Company and also am Chairman of the Committee on Undersea Mineral Resources of the American Mining Congress. I will testify today on behalf of the American Mining Congress. However, the views presented are fully supported both by the Kennecott Corporation and myself.

The American Mining Congress, as I am sure you know, is a trade association composed of U.S. companies which produce most of the Nation's metals, coal, and industrial and agricultural minerals. It also represents more than 300 companies which manufacture mining, milling, and processing equipment and supplies, and commercial banks and other institutions serving the mining industry and the financial community.

The American Mining Congress, recognizing the potential importance of minerals from new sources not yet tapped or even fully explored by man, has had an active Committee on Undersea Mineral Resources for many years now. The committee has concerned itself primarily with the unraveling of the legal/political tangle that has enmeshed and retarded the development of seabed resources. Even now, although

industry has been immensely encouraged by the recent passage of ocean mining legislation, industry is looking with great concern at the Law of the Sea Treaty negotiations just reopened this week in Geneva. It is difficult to imagine how a satisfactory treaty regarding seabed resource exploitation can result from the present draft text.

Now we see history repeating itself with respect to extraterrestrial materials—both with respect to understanding the potential importance of these materials with commercial technology undeveloped and economic resources unidentified and with respect to the proposed underpinnings of a legal regime for space.

To examine this theme of repeated history, and more discouragingly the failure to learn from past history, we must look at the situation with respect to the Law of the Sea prior to the adoption by the United Nations in 1970 of the "Declaration of Principles" regarding the resources of the deep seabed.

At that time there was no understanding by our Government—both Executive and Legislative—or by the industrial community generally of the importance of the seabed resources or of the commercial practicability of their extraction. The words of the few industrial and academic pioneers were largely ignored as the words of impractical dreamers and the words of idealists such as Dr. Arvid Pardo, extolling the riches of the deep seabed, were discarded as unreal.

Accordingly, it appeared quite in order to our foreign policy law of the sea specialist, to sacrifice the deep seabed for other goals better understood and defined at that time.

Extraterrestrial resources are, if anything, in a more precarious position to resist attack and abandonment by the political realists of today. It is not easy to attach a dollar and cents sign to space resources. It is not possible to outline practical mining methods that are economically viable. I cannot tell you what materials may be mined, at what cost, and on what schedule. Thus we are not able to effectively respond to the Committee's desire to quantify "the participation of U.S. industry in exploitation of extraterrestrial resources, the state of technology, and the cost and schedule for such exploitation."

Nevertheless, Mr. Chairman, we must be cautious in writing off the value of resources that are undoubtedly vast because of the fact that we have not yet explored and identified specific mineral deposits for exploitation nor assembled the prototype equipment for mining. Clearly these resources are in our future. It is wise to contemplate the possibility that the resources will be mined and used both on Earth and extraterrestrially to bring untold benefits to our society in ways now only dimly imagined.

Mr. Chairman, in brief let us not again use ignorance as a tool to write off the resources from extraterrestrial sources.

To further examine our theme of repeated history, we must go directly to the principle of the "Common Heritage of Mankind." The phrase "Common Heritage of Mankind" was discussed in the United Nations prior to 1970, but in any event the diverse and radical meaning to be attached to this phrase was largely unappreciated by the developed nations and they unfortunately agreed to its adoption in the "Declaration of Principles" (U.N. General Assembly Resolution 2749(XXV)) regarding seabed resources.

There were some who were disturbed by the "Common Heritage" concept. They saw the dangers inherent in the phrase. In fact, our negotiators even while adopting the Declaration of Principles made a statement saying that the meaning of the phrase would be in accordance with the treaty to be negotiated.

History repeats itself! The negotiators of the Moon Treaty, who appear not to have even heard of the Law of the Sea, assure us that the phrase in the Moon Treaty (Article 11, Paragraph 1), "The moon and its natural resources are the common heritage of mankind", entails no specific obligation on states except the commitment to engage in good faith negotiations on a mutually acceptable international regime for exploitation. This is the same assurance we received in 1970 from the Law of the Sea negotiators. We know where Common Heritage has taken the LOS Treaty on the basis of a U.N. Resolution on Common Heritage. Where will a signed treaty—perhaps to enter into force for most of the world—take us?

The path can be clearly seen by looking at the Law of the Sea negotiation. We have been close observers of the deep seabed negotiation. We have been close observers of the deep seabed negotiations which have—through arduous debate, concession, and compromise—produced draft treaty texts for an international regime and administrative machinery to regulate deep sea mining. We, therefore, believe our experience may be very instructive for United States policymakers faced with the question of whether to sign the Moon Treaty.

As a result of ten years of negotiating effort at the Law of the Sea Conference, the international community has developed numerous treaty texts which give meaning

to the originally vague "common heritage" principle. This effort is all the more significant because, during this same time-span, the Third World incorporated the "common heritage" principle into its program for a New International Economic Order. For the majority of nations, "common Heritage" has come to symbolize a system in which complete international control over access to, and the disposition of, important natural resources is exercised so as to effect the transfer of wealth, technology and political control from the industrialized countries to the developing countries. These concepts have now been elaborated in the deep seabed negotiations in a manner that is inconsistent with the fundamental requirements of private investment in natural resources development.

In order to induce private investment in resource extraction projects involving the development of high technology, a regime must guarantee the investor the exclusive right to exploit and utilize resource deposits he has discovered and explored; not impose conditions which unreasonably restrict profitability or technological and managerial initiative; and afford long-term security. In contrast to these requirements, the deep seabed regime now set forth in the Informal Composite Negotiating Text, Revision 2, has the following characteristics:

No state or private company has assured access to deep seabed resources. Instead, the draft treaty establishes a complex and unworkable system for obtaining contracts with the new International Seabed Authority.

Private companies which obtain contracts for deep seabed mining will be required to pay a significant share of their profits to the International Seabed Authority and to transfer their technology.

They will also have to compete with a heavily subsidized international public mining company, the Enterprise. (Their own governments will be providing these subsidies.)

Development of deep seabed resources will be artificially restricted by a system of production controls designed to give maximum competitive protection to developing country procedures of the same minerals on land.

No private company will be completely assured of the security of investments made in deep seabed mining, since the system of exploitation will be administered by an International Seabed Authority whose basic policies and politico-economic decisions are made by a one-nation-one-vote Assembly controlled by developing countries. Such a policy-making apparatus is considered by most nations to be essential to the fulfillment of the "common Heritage" philosophy.

As you know, the United States has been prepared to accept a deep seabed regime with these characteristics in order to obtain international agreement on a wide variety of ocean law questions perceived as important to our national interest. Whether United States private investment will ever occur in deep sea mining under the treaty depends largely upon the extent to which the draft treaty texts are further improved and refined, and an acceptable outcome is not assured at this time. Even if the texts are sufficiently improved to permit individual companies which have already made substantial financial commitments to invest under the treaty, it is fair to conclude that the deep seabed regime under the final Law of the Sea Treaty will, as an overall matter, not encourage private enterprise participation.

While the "common heritage" doctrine has been most fully elaborated at the Law of the Sea Conference, the Third World has attempted to apply the concept to other international resources, for example, the mineral resources of the Antarctic, the radio spectrum, and high technology. To our knowledge, the Moon Treaty represents the first instance in which "common heritage" has been included as a legally binding principle in a law-making treaty opened for signature.

We recognize that some believe that the law of the sea experience will not be automatically transferable to the context of celestial body resources. It seems to us inconceivable, however, that, in the future celestial body resource negotiations called for under the Moon Treaty, Third World nations will agree to undermine the political and economic value of the common heritage doctrine formulated at the Law of the Sea Conference. Indeed, we believe that the law of the sea experience now very nearly constitutes an international consensus regarding "common heritage" resources, so that most nations will feel legally bound to follow the precedent irrespective of their individual political and economic interests.

Whether or not the ultimate celestial body resource treaty closely parallels the Law of the Sea Treaty, the risk that it may do so will be a serious and probably fatal deterrent to private enterprise expenditures on space resources research and development in the meantime. The exploration of space resources will require enormous front-end capital outlays on R&D programs and will be subject to high technological and economic risks. By adding the political risk that the future international legal regime for such activities will approximate that for the deep

66-705 O - 80 - 10

seabed, the Moon Treaty is likely to preclude private enterprise investment in exploring the potential for space resource development, at least until the new agreement is concluded. Even government-funded R&D programs will confront the same political risks and, lacking significant support from the private industrial sector, may also be adversely affected. Since we predict that, in this interregnum, there will be no significant private capital expended in R&D efforts, the second Moon Treaty might never be negotiated since those negotiations only begin when nations are on the verge of exploitation.

The political risk that a celestial body resource agreement will follow the law of the sea experience is likely to be compounded by the risk that most nations will interpret the "common heritage" principle as mandating a moratorium on commercially-oriented resource activities until the subsequent regime is agreed and in place. For those countries, "common heritage" is synonomous with "common property"; they believe that common property resources are owned by the entire community and that no country or company can remove such resources without the permission of every member of the community. Despite unilateral interpretations by the United States that the Moon Treaty does not impose such a moratorium, few private investors will be prepared to make financial commitments of the magnitude required to develop space resources when they know that the rest of the world contests their legal right to carry out commercial recovery and utilization operations. Here again, this deterrent effect may be just as significant for government decision-makers contemplating publicly-funded R. & D. programs as for private enterprises. One need only review the experience of the American ocean mining industry to understand the adverse effect of an international legal and political dispute concerning the start-up of a new resource development industry.

There are many sound reasons why an international agreement governing resource activities on the moon and other celestial bodies may be desirable. To serve as a suitable basis for future private investment, however, such an agreement should:

Guarantees States and their companies unrestricted rights to explore for, exploit and use space resources;

Allow each State to establish and enforce the basic terms and conditions governing such activities;

Create mechanisms for international decision-making which give those countries with an economic stake influence commensurate with their interests; and

Establish agreed and effective procedures for the settlement of disputes.

We do not believe that unilateral understandings or reservations by the United States to the Moon Treaty can convert it into an agreement that satisfies these criteria. The force of the "common heritage" doctrine will necessarily outweigh the effect of such unilateral assertions, which are not legally binding on other countries.

The United States depends on private enterprise to supply its resource requirements and develop new technologies which permit better utilization of those resources in a manner that advances the economic well-being of the nation. If the resources of outer space are ever to be developed, private capital and initiative based in the United States industry will undoubtedly play a critical role.

It is our considered view, based on experience in the deep seabed minerals context, that United States signature and ratification of the Moon Treaty in its present form will create overwhelming legal and political uncertainties which preclude potential United States industry participation in space resource development. We are not aware of any national interest which would justify assuming the costs associated with the Moon Treaty. In our opinion, it would be tragic for the United States to jeopardize its future, and as yet unknown, economic interest in space resources by repeating the mistake which acceptance of the "common heritage" principle has proven to be in the law of the sea context.

We appreciate this opportunity to present our testimony before you this morning. I would be happy to answer any questions you may have. Thank you.

[The following information was subsequently received for the record:]

Questions of the Committee and the Answers Thereto

COMMON HERITAGE

Question. Should we understand your testimony that when the principle of "Common Heritage of Mankind" was first introduced into the Law of the Sea negotiations the intention was that the meaning of the phrase would be in accordance with the treaty to be negotiated and that our negotiators had in mind a

meaning for that phrase different from what the negotiating history of the Law of the Sea has defined the phrase?

Answer. Yes. Originally, U.S. negotiators believed that "common heritage of mankind" meant that each nation or its nationals have equal access to and rights to develop those resources. The treaty, therefore, was desirable in order to allow the exercise of those rights by one nation or its nationals without the interference by other nations or their nationals; in other words, to provide some legal order. However, under the current draft treaty minerals may only be recovered with the express permission of the International Seabed Authority, under terms and conditions established by the Authority. Even then, the developing countries interpreted "common heritage of mankind" as meaning "common property", with all of its implications. This distinction is more fully elaborated in the testimony of Mr. Leigh S. Ratiner before your committee, and the submission of Mr. Northcutt Ely, which includes a Report, with Recommendation, of the Section of Natural Resources Law to the House of Delegates of the American Bar Association.

Question. In the Law of the Sea negotiation how is the phrase "Common Heritage of Mankind" defined?

Answer. The phrase "common heritage of mankind" is not defined in the draft Law of the Sea Treaty. However, for the majority of nations, "common heritage" has come to symbolize a system in which complete international control over access to, and the disposition of, important natural resources is exercised so as to effect a transfer of wealth, technology and political control from the industrialized countries to the developing countries. The Law of the Sea Treaty not only establishes an elaborate regulatory framework and international organization for the control of the exploitation of the mineral resources of the deep seabed, but it also establishes an international mining company (the Enterprise) which will have privileged and tax-exempt status vis-a-vis private entrepreneurs interested in engaging in deep seabed mining. The multi-faceted discrimination in favor of the Enterprise and gross excess of discretion to be reposed in the Authority—free from meaningful recourse against abuse of administration—make it unrealistic to expect future participation by private enterprise under such a regime. In practical effect, therefore, the "common heritage of mankind", will be given meaning by the International Seabed Authority as established by the Law of the Seas Treaty, and that meaning takes on concrete form in the establishment of the Enterprise as being the mining arm of the International Seabed Authority.

The present existence of the "parallel system" in the current text of the Law of the Sea Treaty, which would allow private companies to receive a contract for exploitation of the deep seabed minerals, it is no more than a concession to the developed countries and to the pioneering companies who, by the expenditure of tens of millions of dollars and years of research and development, have brought the commercial exploitation of the seabed minerals close to the point of practical realization. But, even this concession to those whose creativeness and inventions have made seabed mining possible and thereby made the existence of an international seabed authority possible, may only be temporary since the Treaty contemplates a review conference at the end of 15 years after the first commercial production.

The "parallel system" contemplates private industry receiving a contract to mine one of two mining sites submitted to the Authority. The remaining site, as selected by the Authority, is reserved for direct mining by the enterprise or by developing countries. The underlying purpose of the parallel system is to permit the Enterprise to obtain financing (which is to be contributed on a basis of U.N. contributions as well as from profit sharing from private company licensees) and to receive the massive transfer of technology required by the Treaty from participating companies (see Article 144 and Article 5 of Annex 3 of the Draft Law of the Sea Treaty) in order for the Enterprise to engage in deep seabed mining directly. The Treaty also provides for training the personnel of the Enterprise in the use of the technology to be transferred.

Technology used but not owned by the licensee will also be subject to the technology transfer provisions. No security of technology or trade secrets is provided; on the contrary, the possessor, if he participates either directly or indirectly in deep seabed mining activity, would be required to make that knowledge available to the Enterprise as well as developing states under "fair and reasonable terms and conditions" (article 144, paragraph 2(a)). Unless the current draft of the Law of the Sea Treaty is modified, it seems to us that the gound work is laid for an eventual effective monopolization by the Enterprise of seabed resource development.

Question. According to administration witnesses the negotiating history of the Moon Treaty clearly does not attach the meaning to "Common Heritage of Mankind" as the phrase has taken on in the Law of the Sea Treaty negotiations. Your

view, however, is that it will be difficult to stop the phrase from taking on the same meaning during the conference to establish the international regime. Would you please comment?

Answer. The term "common heritage of mankind" clearly has a meaning now to the developing world, and that meaning has been repeatedly buttressed in their public statements. Therefore, it seems unrealistic to believe they will abandon that entrenched meaning, particularly since it has become a rallying point for the "new international economic order", as the term is applied to the Moon Treaty. I believe the report of the ABA Section on Natural Resources Law referred to earlier makes this point quite well:

Lest it be thought that slight differences in language between the treaty on the "celestial bodies" and the treaty on the sea are significant, one need only to refer to recent statements of spokesmen of the less developed countries about the Moon Treaty. For example, Mexico's representative recently stated before the U.N. Special Political Committee: "Regarding the treaty on the Moon * * * this agreement provided that the resources from the Moon were the resources of mankind, just like the 'historic decision' on the resources of the seabed."

The delegate of Peru to the Law of the Sea Conference recently extended the same notion to Antarctica as well as the Moon. He said: "The temptation to apply to Antarctica the same principles which were the basis for the regime of the seabed is very great and some have not been able to resist it. This temptation should increase now that the United Nations committee on peaceful uses of outer space has decided to recommend to the General Assembly a draft treaty which would declare the Moon also constitutes the common heritage of mankind."

Additionally, I enclose a copy of a letter from Mr. Douglas M. Webb of our company to Mr. Robert B. Owens, Legal Advisor of the State Department, as well as a letter from J. Allen Overton, President of the American Mining Congress, to Mr. Owens which will supply a further explanation of this point.

Question. Do you believe that the domestic legislation enacted this month will be sufficient to encourage companies to pursue deep seabed mining, even in the absence of an International Law of the Sea Treaty?

I am not able to speak on behalf of all of the ocean mining companies as each has its own corporate plans and they are unknown to me. However, Mr. Phillips Hawkins, President of Ocean Mining Associates, recently addressed the American Mining Congress at its convention in San Francisco. In that address, Mr. Hawkins said that the likelihood of a domestic licensee engaging in ocean mining relates inversely to the degree of likelihood that he will be subject to a treaty such as the draft convention of the Law of the Sea. Mr. Hawkins noted that the domestic law requires our negotiators to obtain a grandfather clause in the treaty, but the draft treaty fails completely to carry out those instructions. He agreed with Ambassador Richardson's appraisal that it was impossible to obtain such a clause in the Treaty. However, he said, "Even though I have no hope there will be a meaningful grandfather clause, my concern is minimized as I believe there will be no treaty of the sort before us, and hence no need for a grandfather clause." A copy of Mr. Hawkins' address is enclosed for your information.

Question. How would you characterize the status of the deep seabed mining industry at this time? If you perceive the industry as being inactive, or in a holding pattern, has this been the result, either directly or indirectly, of the lack of agreement on a Law of the Sea Treaty?

Does the deep sea mining industry believe that it could function profitably under a future regime such as that being negotiated for deep seabed resources?

Answer. The answers to these two questions are probably best expressed in the resolution on undersea mineral resources recently adopted by the Board of Directors of the American Mining Congress. The views expressed therein are a consensus of the ocean mining industry and has been carefully scrutinized by the Resolutions Committee and the Board of Directors of the American Mining Congress. A copy of that resolution is enclosed.

Question. At Law of the Sea conferences, has the U.S. made unilateral statements about what it believes "Common Heritage" to mean? Also, how have such statements been received by the developing nations?

Answer. The U.S. negotiators consistently stressed in public statements that "common heritage of mankind" meant freedom of access, but the developing countries have consistently insisted that to them it meant "common ownership.". U.S. arguments have not been accepted by the Group of 77 (the organization of the developing countries in the Law of the Sea Negotiations).

Attachments. [1]

---

[1] The attachments were not reproducible and are in the subcommittee files.

Senator STEVENSON. Thank you, Mr. Dubs.

We are going to have to recess for three back-to-back votes, so it will probably be half an hour before we can reconvene.

[Recess.]

Senator STEVENSON. Our next witness, Franklin D. Kramer, Principal Deputy Assistant, Secretary of Defense, has been excused. His testimony will be printed in the record as if read and we will send him some questions.

STATEMENT OF FRANKLIN D. KRAMER, PRINCIPAL DEPUTY ASSISTANT, ASSISTANT SECRETARY OF DEFENSE FOR INTERNATIONAL SECURITY AFFAIRS

Mr. KRAMER. Mr. Chairman and members of the committee, I am pleased to appear before you today to discuss on behalf of the Department of Defense certain aspects of the agreement governing the activities of states on the Moon and other celestial bodies, generally referred to as the Moon Treaty.

As you know, the executive branch is presently engaged in an interagency review of the Moon Treaty. I would like to make clear at the outset that, while the Department of Defense participated in the Moon Treaty negotiation process, we, like other participating agencies, are currently reviewing it carefully and DOD has not as yet taken a final position with regard to whether it is in favor of or opposes U.S. signature to and ratification of the treaty. We have, however, identified certain areas of national security interest regarding the treaty which in our view should be adequately reviewed and appropriately resolved during this process.

Before I begin that discussion I would like to address some of the other questions posed in the chairman's letter of June 18, 1980, to Secretary Brown.

The first area concerns the importance of extraterrestrial materials to future national security. DOD has reviewed the recent NASA study which provides information on those resources available for future exploitation and the technology needed to exploit them. This study tells us that appreciable amounts of silicon, aluminum, titanium, iron ore, and magnesium, are to be found on the Moon and other celestial bodies.

In 1979, the United States was a net importer of four of these minerals: Aluminum, 8 percent; iron ore, 28 percent; magnesium, 98 percent; and titanium, 100 percent. In addition, aluminum and titanium are included on the national defense stockpile inventory of strategic and critical materials. Needless to say, all of these minerals are used extensively in the manufacture of current defense hardware.

However, as the NASA study points out, it is doubtful that extraterrestrial resources could be considered a competitive economic resource for return to Earth. Therefore, it seems more likely that if we someday achieve the capability to exploit extraterrestrial materials, they will be used in space and not returned to Earth.

Although DOD has no present plan to establish extraterrestrial facilities that would require the use of extraterrestrial resources, it is conceivable that the United States would need to build large structures in outer space in the future, for example, the proposed solar power satellite. These facilities would probably be larger than

anything that could be transported already assembled by any feasible space transportation system.

In addition, the transportation costs and environmental impacts associated with transporting terrestrial resources to outer space may well preclude the use of Earth resources to construct such facilities in outer space. Since there does not appear to be any fundamental technological reasons why extraterrestrial resources cannot be mined and fabricated in space for use in these large structures, it is therefore conceivable that at some point in the future extraterrestrial materials will become increasingly important, even critical, to our continued use of outer space and to our national security.

The DOD was also asked to comment on the establishment of an international regime to govern the exploitation of extraterrestrial resources. The DOD is interested, from a national security point of view, in insuring that the provisions of the treaty relative to exploitation of extraterrestrial resources are satisfactory from the U.S. point of view. I understand that these issues were discussed at length at your hearings earlier this week, and we will of course be focusing carefully on the consideration of these issues in the interagency review.

Other areas of interest to us from a national security point of view relate to the potential scope of coverage of the treaty and the application of the treaty's prohibitions to various possible space activities of interest to DOD. As a part of the interagency review process, we in DOD examined the treaty in detail in terms of its relation to U.S. arms control, security policies, and national interests. The arms control content is generally consistent, I believe, with U.S. policy and interests. It reconfirms the arms control regime already in being under the 1967 Outer Space Treaty.

In my view, this is a positive advantage in that not all nations which are space powers are signatories to the Outer Space Treaty. The perceived benefits to be gained from ratification of the Moon Treaty would possibly encourage such action by those powers, thus subjecting them to those arms control provisions of the Outer Space Treaty repeated in the new agreement.

On the other hand, we must pay close attention to the expanded scope of applicability of some of the provisions borrowed from the Outer Space Treaty. Restraints which applied heretofore only in Earth orbits or upon the surface of the Moon and other celestrial bodies would apply under article I, paragraph 2, of the Moon Treaty to vast new areas of outer space, namely the undefined orbits around and other trajectories to and around all celestrial bodies.

We will be looking carefully at the language of the treaty, and in particular Article 3, which largely repeats the language of the OST, to insure that certain possible nonaggressive military activities in deep space or in the vicinity of the Moon are not precluded. In this regard, we will want to insure that the treaty's references to peaceful purposes and to the threat or use of force are interpreted in a manner consistent with U.S. interpretations of the OST and the U.N. Charter.

I should reemphasize that all of these potential concerns are raised in a preliminary fashion. The Interagency Review is ongoing

and it may be that many or all of the matters I have referred to will be adequately dealt with during the review processes. It may, of course, be necessary to consider understandings, declarations or reservations to the U.S. instrument of ratification in this regard.

This concludes my review of the treaty. I would be pleased to answer any questions.

Senator STEVENSON. Thank you very much.

Mr. KRAMER. Thank you, sir.

[The following information was subsequently received for the record:]

QUESTIONS OF THE COMMITTEE AND THE ANSWERS THERETO

Question. Does the Department of Defense recommend the signing and ratification of the Agreement?

Answer. While DOD presently has some concerns regarding the Agreement, these concerns are being explored in the ongoing Interagency Review. It is premature to say at this juncture whether DOD will support or oppose signature and ratification, and under what conditions, if any.

Question. Would the Agreement in any way jeopardize our national security interests?

Answer. As noted, the Interagency Review is not completed. We are closely examining the potential impacts of the agreement. It does not appear to affect any present or planned DOD space activities. We are also reviewing its potential impact upon possible future DOD space activities, and our review is not complete.

Question. How would the security interests of the United States be enhanced by this Agreement?

Answer. U.S. security interests could be enhanced by the acceptance by other nations through their ratification of the Agreement, of its arms control provisions and other provisions which would limit certain military activity. In view of the fact that not all nations which are space powers are signatories to the 1967 Principles Treaty, another possible benefit could derive because of repetition of certain arms control provisions in this agreement. Those nations may see benefits to be derived from the Agreement that do not exist with regard to the 1967 Treaty which would encourage them to ratify the new Agreement, thus subjecting themselves to its arms control provisions and other constraints on military activity.

Question. How is the "Agreement Governing Activities of States on the Moon and Other Celestial Bodies" related to the security interests of the United States?

Answer. Ratification of the Agreement could affect the security interest of the United States since it expands the applicability of arms control language found in the 1967 "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies" to vast new areas of outer space, including the orbits around and other trajectories to and around all celestial bodies except earth. The Department of Defense is currently participating in an Interagency Review which examines, inter alia, the security implications of the agreement.

Senator STEVENSON. Our next witnesses are Dr. James Arnold, Department of Chemistry, University of California, and Mr. Edward Bock of the General Dynamics Corp.

Gentlemen, if you would summarize your statements, it would be helpful. Please proceed. Dr. Arnold.

STATEMENTS OF DR. JAMES R. ARNOLD, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF CALIFORNIA; AND EDWARD H. BOCK, GENERAL DYNAMICS CORP.

Dr. ARNOLD. Thank you very much. I was smiling this morning at Senator Schmitt, who has more credentials as an expert on lunar mining than I do. He was describing very well the state of lunar resources, the fact that there are valuable materials there and that the use of the resources of the Moon and certain asteroids in space is technically possible now and may be economically and

politically attractive or even necessary for us sooner than we think. That basically is my message.

I have been looking into this matter technically for some time. Its relevance to the Moon Treaty seems to be this: The negotiation has perhaps been carried on with insufficient attention to this. There are various things in the document itself and in Mrs. Galloway's excellent history of the negotiations, which suggest that the negotiators weren't particularly preoccupied with this matter, or perhaps even informed about it. It seems to me this is the opportunity, as the Senate approaches the question of advice and consent, to look very carefully at that and see whether the interests of the United States and the world in economic progress are properly served by the treaty as it now stands.

Thank you.

[The statement follows:]

STATEMENT OF DR. JAMES R. ARNOLD

We are in the midst of two revolutions in technology whose consequences are visible to all of us. One is microelectronics and computers, the other DNA and genetic engineering. The use of space, its resources and special properties, is a third revolution. The others began about three decades ago. The space era started with Sputnik in 1957. It is a little younger, and it will probably take a little longer, but it is coming.

It is hard in a brief statement to do justice to this subject. I have done a little better in a recent article (Arnold, 1980). The reports by seeral groups which are referenced there give technical details. Books by Dyson, O'Neill and Heppenheimer give the broader picture. Here I can only say that the use of the resources of the moon and of certain asteroids in space for human benefit is technically possible now, and may be economically and politically attractive (or even necessary) for us sonner than we think.

The potential applications rest on the special attributes of the space environment: zero or controllable gravity, vaccum, and the continuous availability of intense solar heat at any desired scale. The value of lunar and asteroidal materials is due to the small energy requirement for bringing them into space. If you go down the street to the National Air and Space Museum, and compare the size of the Saturn V, which carried three astronauts from the earth, and the Lunar Excurision Module, which carried them to and from the lunar surface, you will see they are literally worlds apart. One does not even necessarily require rockets to lift matter off the moon.

What is on the moon? The surface layers contain, as soil and rocks, good concentrations of most of the elements we need in large quantity for human life and industrial civilization. These include oxygen, iron, aluminum, titanium, and silicon. Sulfur, carbon, and nitrogen are needed and are present, in smaller amounts. The most conspicuous gap in our present state of knowledge is a supply of hydrogen or its essential compound, water. I believe there may be a great deal in the deep freeze in unexplored polar regions. If not, certain earth-approaching asteroids can supply water, and other useful substances such as iron-nickel already in metallic form.

We cannot yet foresee the uses of this material in detail, any more than the discoverers of the structure of genetic material foresaw bacteria making insulin. But we have reason to believe they will be dramatic.

What has this to do with the "moon treaty?" First, we must remind ourselves that as now written it makes law not just for the mood but for asteriods and potentially all accessible natural objects in space. Second, study of the doucment and its history suggests that practical applications may not have been seen as an important issue by the negotiators. In a world where the economic and social progress of the United States depend so much on our leadership in technology, I would urge you to regard it as such, and to examine the question of ratification very carefully from this point of view.

Attachment.

James R. Arnold

Views

The Frontier in Space

Will we be true to our nature and accept the challenge of the next frontier?

The human species distinguishes itself from its relatives by a number of attributes. One is range. Starting, as is now believed, from a center in Africa, human beings had already spread ten thousand years ago into every continent (except Antarctica) and every climatic zone on the planet. Long before the invention of writing and the appearance of cities, our ancestors had adapted not only to all habitable climates but to a wide variety of plant and animal food and to a range of technologies for providing basic human needs. This trait in humans is undoubtedly "culture-bound"—there are very rigid societies—but generally speaking we seem to be descended from the migrants and innovators. So far as we know, the chimpanzees and gorillas have not left home.

Twenty years ago it would have been unnecessary to remind people of this. "Progress" was taken for granted, especially in the United States, a country inhabited almost exclusively by immigrants and their more or less immediate descendants. The western frontier was an essential element of our historical vision of ourselves. Today our mood is more critical of technical adventure and exploration. On a finite earth this is reasonable, and indeed long overdue. However, it also tends to stifle the creative impulse. Where we formerly embraced novelties both good and bad, we may now be resisting them equally.

The purpose of this article is to explore one new idea: the possibility of people living and working away from the planet Earth. There may now be outlets for the deep human urge to move onward that were imagined only by a few dreamers even in the more expansive era of the fifties. The ideas set forth here owe very much to the leading exponent of space settlements, G. K. O'Neill (1978). The subject is illuminated beautifully from a different angle by Freeman Dyson (1979).

Of course, we have already been exploring space. So far, however, the tie between astronauts or cosmonauts and the ground has been close. The phrase "Mission Control" says it all. If a true frontier in space is to be created, we must move toward a far greater degree of autonomy for those who would live there. There seems little likelihood at present that the spirit of adventure or national pride alone can nourish such a frontier community. There must be some tangible value: the resources of space must be put to use.

What do we mean by use? Civilizations have always rested on supplies of four essentials: labor, materials, energy, information. The labor used until recently was that of masses of slaves, in name or in fact. It is the special character of a technical society that the conditions of labor are more and more transformed by increasing supplies of the other three components. It is the dramatic development of materials, energy, and information that has eased and equalized the burden of labor. Whatever basic decency our particular culture can lay claim to is made possible by this transformation.

Space provides a wide range of opportunities to continue this process. So far, all the major effects have been in the information segment. Telecommunication and weather forecasting use satellites on a large scale ever more effectively. Less measurable, but perhaps more significant, are our learned ability to succeed in complex and dangerous enterprises ("If they can go to the moon, why can't they . . . ?") and our slowly increasing grasp of the unity and fragility of the planet Earth.

To make use of the energy and material resources of space, we require at a minimum the improved transport capability to be provided by the Space Transportation System (Space Shuttle). The first flights of this system are expected soon. Each flight will be able to carry into near-Earth orbit something like the contents of a railroad box car—a few tens of tons—at a cost in round figures of some hundreds of dollars per kilogram. This is a marked reduction from earlier costs, but it is still not cheap.

A later generation of transport sys-

James Arnold, Professor of Chemistry at the University of California, San Diego, served with the Manhattan Project from 1943–46 and was a member of the faculty at the University of Chicago and at Princeton before going to the University of California in 1960. In the '40s and '50s he worked with W. F. Libby on the development of radiocarbon dating and was one of the developers of the liquid scintillation spectrometer for C^{14} and H^3. He discovered the Be^7 and Be^{10} isotopes in nature and has studied their distribution in the natural environment. Since 1960 his work has been mainly on cosmic-ray products in meteorites and in lunar samples. The recipient of many awards, he has been honored by NASA with its medal for Exceptional Scientific Achievement. Address: Department of Chemistry, University of California, La Jolla, CA 92093.

tems, such as those that might be available in the 1990s, can be expected to reduce this cost further, perhaps by ten times or even more (Bekey and Mayer 1976). It is not easy to do this, however, because the escape velocity from the Earth, 11.3 km/sec, is large. The minimum energy imparted to the payload must be 6.4×10^{11} ergs/g, to escape the Earth's gravitational field entirely.

This is larger than the energy content per gram of chemical fuels and imposes a requirement for large, complex, and precise launching systems such as the STS. The atmosphere of the Earth is a further hindrance to going out, though it can be very helpful (as a brake) in coming back in. If useful materials in space were available without going through this expensive and difficult lifting process, there would be marked advantages.

What's in space?

Advantages for what? Is there anything we think we can do uniquely, or better, or cheaper, or with less pollution in space than we can on Earth? There is reason to think so.

A useful way to view the possibilities is to look at three essential differences between the space environment and our own. The first is "weightlessness." The effective force on an object in a spacecraft is very small—typically on the order of 10^{-5} times Earth gravity or less. An object at rest in the local coordinate frame tends to remain so. This changes, for example, the meaning of the word "container."

A second difference is in the availability of solar heat. At a relatively short distance from the Earth there is no weather and no night, and thus solar energy becomes steady and virtually uninterrupted. Because of the day-night cycle, and the absorption and scattering of the Earth's atmosphere, the effective intensity of sunlight at the Earth's surface is only a small fraction of the 1.5 kW that fall on 1 m^2 at right angles to the solar beam. In space we get it all. Collectors for solar heat can be light and simple. Thus heat is available, at very low cost, at any reasonable scale required, in almost any desired place far enough outside the Earth's atmosphere. To convert this heat to electricity, at an efficiency on the order of 10%, is a known though still fairly expensive art.

The third major difference is the absence of an atmosphere. Far from human activity, the vacuum of interplanetary space is at a level ≤ 10 molecules/cm^3, or 10^{-15} torr—better than any attainable laboratory vacuum. Around a space habitat or space factory the vacuum would be much poorer, because of inevitable leakage of gases. However, even such a relatively poor vacuum is potentially useful—for example, as an environment for fabrication of reactive metals. Even a very high vacuum could be maintained with careful factory design. Because the vacuum is always present, the "pumping speed" would be very high, thus speeding up high-vacuum operations over the time for equivalent operations on Earth.

We can already give some simple examples of the usefulness of these properties. We cannot yet perceive the possibilities of combining them in new patterns, of mastering the art of working in space. The first automobiles and airplanes, and computers even up to the present, remind us that our mental blinders can delay for decades the realization of the best design and use of something really new. In space all this is still before us.

A clearly identified barrier to activities in space is the cost and difficulty of bringing material there from the deep gravitational well of Earth. Fortunately there are two alternative sources of useful materials—the moon and near-Earth asteroids.

Given the escape velocity, 2.3 km/sec, we can easily calculate the energy requirement for bringing material from the moon. It is 2.6×10^{10} ergs/g—less than 4% of the figure for the Earth. In one way this understates the relative cost, since we must put the mining and launching systems on the moon first, using terrestrial materials. How to do this most economically is at present a subject of active study. In another way, it overestimates the cost. The fact that 2.6×10^{10} ergs/g is small compared to the energies from typical chemical fuels means that simple, light propulsive systems will serve. O'Neill and his colleagues are developing a device called a "mass driver," which has the capacity to eject matter from the moon using modest amounts of electrical energy, without fuels or rockets (Chilton et al. 1976). This device has very attractive possibilities.

We have done a little prospecting on the moon. Twelve men have spent hours or days on its surface, collecting a few hundred kilograms of samples from six places, all at low latitudes on the front side. Soviet unmanned spacecraft have returned samples from three other sites in the same zone. Other American and Soviet spacecraft have provided data from the surface or from orbit. The Apollo 15 and 16 missions carried into orbit geochemical instruments that made remote analyses of about 20% of the lunar surface for several major elements and for the radioactive elements.

As a result we have a pretty good knowledge of the common materials on the lunar surface (Taylor 1975; Bielefeld et al. 1976). The soil and rocks we have surveyed fall mainly into three broad compositional classes. Like the major rocks of the Earth, all are silicates. Most of the moon's surface (but not most of the front-side equatorial zone) is "highland" material, comparatively light in color and low in density. The lightest materials there (in both senses) are anorthosites, rocks that are high in aluminum and calcium (Table 1).

In the dark lunar maria that are widespread on the front face of the moon, we find basaltic lavas from the lunar interior, which are rich in iron. They contain variable, sometimes strikingly high, concentrations of titanium. A more localized, but still abundant, material on the lunar surface was given the acronymic name KREEP—from K (potassium), Rare Earth Elements, and P (phosphorus)—by the late Paul Gast. KREEP contains high concentrations of a large number of minor and trace elements, including the radioactive elements potassium, thorium, and uranium.

Everywhere the soil (but not the rocks) contains a fraction of a percent of metallic iron and interesting quantities of several light elements, the result of billions of years of bombardment by the solar wind. These solar-wind components include hy-

drogen, carbon, nitrogen, and noble gases in the general range of 0.01% by weight. Sulfur is also widespread, at a level about 0.15%. These important materials appear to be more concentrated in finer soil fractions, but data are still incomplete.

We do not know if there are rich mineral deposits on the moon. Conventional wisdom does not encourage us to seek them, because most (but not all) valuable deposits on Earth were formed by processes involving abundant water. But conventional wisdom did not predict the presence of the remarkable "orange glass" deposits found by the Apollo 17 astronauts. We must conservatively assume that rich mineral concentrations are absent, but we may be wrong.

One commodity clearly absent on the areas of the moon we have explored is water. The rocks are all dryer than any known on Earth. The only local source of water would be through a chemical combination of the solar-wind hydrogen embedded in the soil with the oxygen of the rocks, which might yield about 0.1% water by weight (one liter per ton of soil). Recovering such a tiny amount of water does not appear to be attractive economically, though as always there is room for ingenuity. But there is one other possibility.

Some time ago Watson and co-workers (1961) pointed out that craters near the lunar poles, into which sunlight never falls, make up about 0.5% of the lunar surface. With no atmosphere to carry heat to the dark areas, they must be very cold—in the range of −170° to −250° C. In such places, ice has effectively a zero vapor pressure; put there it will presumably remain forever. These authors suggest that any water vapor liberated over the entire surface of the moon would be transported and stored as ice in these craters.

Today we know far more about the moon than we did in 1961. Many details of the discussion by Watson and co-workers are obsolete. In a reanalysis of the problem (Arnold 1979), I have estimated that 10^{16}–10^{17} g of ice may be found in the polar cold traps. But this is a paper study, not an observation, and we can settle the question only by an appropriate experiment, such as gamma-ray mapping from a polar-orbiting spacecraft. A spacecraft with present-day instrumentation could also give us far better information on the composition of the whole lunar surface than the Apollo missions provided for 20% of the surface.

Because we cannot count on finding rich deposits of minerals or water on the moon, we should plan to make use of ordinary lunar soil and rocks.

Table 1. Compositions of lunar soils collected during three Apollo missions (percentages by weight). Apollo 11 soil is a titanium-rich material from a mare; Apollo 14 soil is the unusual potassium-rich material called KREEP; Apollo 16 soil came from the highlands.

	Apollo 11	*Apollo 14*	*Apollo 16*
O	42.06%	44.16%	44.88%
Si	19.64	22.39	21.00
Al	7.37	9.31	14.13
Ca	8.58	8.00	11.13
Fe	12.23	8.06	4.27
Mg	4.77	5.57	3.59
Ti	4.48	1.04	0.35
Na	0.33	0.50	0.36
K	0.12	0.46	0.11
Cr	0.21	0.17	0.08
Mn	0.16	0.11	0.05
P	0.05	0.23	0.05

SOURCE: Taylor 1975

The elementary abundances shown in Table 1 must be compared to the needs for industrial production and for human comfort. On Earth, two hundred years after the start of the industrial revolution, we have become accustomed to using essentially all the elements of the periodic table for one purpose or another. During the early stages of space manufacturing, we will have to get along with only a fraction by mass (much less than unity) of lunar material in our products. The components to strive for are the materials needed in the largest quantities. These are few and predictable (Criswell and Waldron 1978): oxygen, water, construction materials (concrete and steel or their equivalents and perhaps glass), and electrical conductors.

The elements that we are sure to need are oxygen, silicon, iron, aluminum, and hydrogen. These are abundant in normal lunar materials, along with titanium (in some mare basalts)—also a very useful structural metal. Only the amount of hydrogen is doubtful. The next largest requirements are carbon, nitrogen, and sulfur (for food sources and organic synthesis) and alloying elements like manganese. These elements seem to be present in lunar soil in adequate amounts, though more concentrated sources would be welcome.

Now let us turn to the other potential source of materials, the near-Earth asteroids. In a short article I can give only a brief account of their supplementary role (see O'Leary 1977; Helin and Shoemaker 1977; Shoemaker et al., in press). We have only general indications of their composition from direct observation, but we can infer that at least some of the meteorites in our museums are probably fragments of the same materials. Of special interest among them are the meteorites called carbonaceous chondrites, which contain bound water, and the so-called iron meteorites, which are composed of an alloy of iron, nickel, and cobalt. It has even been suggested that iron asteroids might someday prove to be a potential resource for use on Earth (Gaffey and McCord 1977).

The Earth-approaching asteroids are

as yet little studied. The list of objects is now about fifty and growing fairly rapidly: there may be as many as a thousand large ones, on the order of 1 km or more in the longest dimension, and greater numbers in smaller size ranges. The escape velocities from asteroids are very small, but a lot of energy would be required to bring them (or fragments of them) close enough to the Earth to be used. There is as yet no known asteroid for which the energy needed is lower than it is for lunar materials to be brought near the Earth. Very likely some will be found in the future.

A way around this problem has been suggested by Bender and co-workers (1979). It has been known for a long time that asteroids or comets passing near a planet are subject to gravitational perturbations capable of causing major changes in shape, size, and period of orbit. This effect has been used deliberately to modify the orbits of exploring spacecraft, for example in the Mariner 10 mission to Venus and Mercury. According to Bender and co-workers, it is possible in the case of some known Earth-approaching asteroids to find schedules of propulsion which would cause the asteroid (or some portion of it) to make a series of close approaches to the moon, Venus, and perhaps the Earth (though safety questions arise here). If this could be done the requirement for propulsive energy to move an asteroid would be drastically lowered. In effect, the orbital energy of the planet approached would supply the difference. The disadvantages of this technique are that diversion is possible only at certain special times for a given asteroid and that the required transport times become much longer. Still, extending greatly the list of available asteroids improves the prospects of using asteroidal materials.

Thus we know that nearly all the materials most necessary for living, working, and building in space are available on the moon. Unexplored lunar regions may contain others, as well as more convenient forms of the elements already known to be there. Water is the most serious potential gap. But it is almost surely available from some Earth-approaching asteroids, which may be very attractive in the long run as sources for other materials as well.

Means of recovery

The transformation of excavated ores into manufactured articles requires a long succession of operations which on Earth are carried out by separate industries. In a frontier environment, the processes must be simplified. The need for simplification and the extremely different conditions in the space environment force us to rethink everything. A few people have already devoted some thought to the problems and possibilities involved (see, for example, Arnold and Duke 1977; Rao et al. 1979; Bock 1979) and have formulated some guidelines.

The first step illustrates the contrast. On Earth, with a well-explored planet at our disposal, the miners' rule is that "grade wins." That is, a small increase in content of the desired element in an ore pays for a large additional investment in equipment, labor, transportation cost, and so on. On the moon, with limited knowledge and high investment costs, there is every reason for ease and convenience to win. The top few meters, at least, of the lunar surface are already converted to fine particles by micrometeorite impact. The location of a mining site at a point where two or even three major surface materials are available nearby would permit a wider choice of materials. The "mining" could be done with simple soil-moving equipment. Of course, if we find rich deposits on the moon, we could revert to a more Earthlike pattern.

For the next step, the isolation of each desired element (at least in crude form), there is a wide assortment of possibilities. Four analyses of the problem to date have yielded four entirely different schemes (the most recent study, Bock 1979, summarizes earlier ones). My own choices are intuitive and arbitrary; more work is needed, especially in the laboratory.

It must be emphasized that the energy requirements to produce useful materials from lunar soil will be much greater than those needed to produce the same materials from ores on Earth. Not only are the concentrations lower but most chemical forms are more difficult to use (silicates rather than oxides or sulfides). The typical energy penalty may be as much as a factor of ten. However, as we have seen, solar heat energy is abundant in space, and thus heat requirements for processing are probably not an important constraint. Because electrical energy in large quantities will require a larger investment in solar cells or a competitive technology, most of the processes under consideration use heat energy, primarily or entirely.

For iron we can go either of two ways. A simple method is to make a magnetic concentrate of the raw lunar soil. The natural soil content of metallic iron, about 0.5%, can probably be increased to more than 10% by magnetic separation. Then melting, using concentrated solar heat, would yield a crude iron separate. This method is straightforward, but it does not recover the much larger iron content of the silicate minerals.

The simplest imaginable process by which to recover iron from silicate materials, without using reagents, is direct electrolysis of molten lunar soil or rock. The lunar soil could first be melted in place, with a minimum of processing, using solar heat. A shell of solidified material would hold the molten material, and electrodes could be inserted into it to produce the desired metallic products. Haskin and Lindstrom (1979) have recently shown (on a small laboratory scale) that iron and titanium can be recovered at the cathode, and oxygen under some conditions at the anode. It may be very difficult to produce aluminum by such a process.

The simultaneous production of oxygen is a major advantage of electrolysis. The uses of oxygen in a space economy are many. We will probably need more of it than any other purified substance.

How to begin

The old frontier was developed in different ways. The government supported discovery and exploration of new lands. Land companies, fur companies, and, later, railroads provided capital. With few exceptions, individuals were able to move out on their own only after the first stage had passed.

Space exploration up to now has been supported by governments. To justify the next stage—assuming it to be in-

vestment based on hope of economic return—the economic expectations must be commensurate with the necessary investment. If a very large initial investment is required, a very large industry must be created to produce the cash. Only very rich players can join the game.

Until recently there has been a general perception that the entry stake must be very large indeed. Studies sponsored by NASA have yielded estimates of start-up costs in the range of $50–100 billion. This amount would allow the transport of lunar material, on the order of 10^5 tons/year—enough for quite a large industrial enterprise—to some assembly point in space. But the size of the "front end" investment has narrowed down the possible industries, in effect, to one: production of electrical energy for terrestrial use. The United States today buys $50–100 billion worth of oil from OPEC countries each year. Thus logically we should be prepared to consider an investment of this size for a program that could make a major reduction in our energy dependence.

The idea would be to manufacture and assemble in space very large arrays of solar cells. An array with an electrical output of 1000 MW (the size of a typical nuclear station) would have an area of 5 km^2 or more, depending on cell efficiency. Placed in a 24-hour (geosynchronous) orbit at any desired longitude, it would radiate its power at microwave frequencies to a fixed open-structured receiving antenna on the Earth's surface, which would then relay the energy to power transmission grids and eventually to the consumer.

The economically optimum size of such a power plant, it is asserted, is in the range of 5–10,000 MW (Glaser 1977; O'Neill 1975). This would require a solar-collecting area of tens of square kilometers, with a radiating antenna not much less than one kilometer across. An array of this size would dwarf man-made structures on Earth; the nearly force-free environment of space makes it possible.

These power stations, according to the calculations, could produce both energy and profits, based on projected costs of alternate sources (chiefly coal and nuclear). Such estimates at an early technical stage are, of course, vulnerable. However, as recent history suggests, nasty surprises can also crop up in other energy technologies. I believe the argument for pursuing satellite solar power as one of our energy options is very strong. It is to be hoped that the next step, a 25-kW prototype in space, will be authorized soon.

No new energy source can yet be accepted or rejected on economic grounds alone. Solar power has one obvious advantage not yet mentioned—it can be monopolized by no one country or small group of countries. On the other hand, the use of microwaves to radiate large amounts of power through the atmosphere has been questioned on environmental grounds. In my view, the health hazards of low-level microwave radiation have been greatly exaggerated. However, we must be sure. There may be other undesirable effects, for example on the ionosphere.

Whatever the assessment of the desirability of satellite solar power stations made from lunar materials over the next few decades, it is clear that the large entry cost is a serious deterrent, even though the Apollo project reminds us that huge enterprises in space can be managed and can achieve their goals within the original budget. Those of us who want to see the space frontier opened are currently rethinking the problem, in an effort to find paths that begin in a more natural way, with small-scale projects of use and profit, which can lead on as our experience grows to activities of increasing scale. Dyson (1979) has given persuasive arguments that this can be done. As one physical scientist to another, I cannot quite accept his economic arguments. We may have to work on an intermediate scale: the level of one to a few billion dollars, which is now actually available to very rich individuals, companies, and small countries.

We do not know yet what the first small steps will be. Very likely crystals of unusual size, perfection, and composition can be made in space and used in new ways. Composites of new kinds, including foams and fiber-reinforced metals, are another promising class of materials for manufacture in the space environment. The long-standing synergism between space technology and computer science can be expected to continue. Some remarkable consumer products (silent alarms? wrist telephones?) may use satellite links. Industrial robots in space may be one element in reducing manufacturing costs.

When can we expect to be well started on this process? Opinions will differ widely, but an experience of my own may be some guide. In 1950 I was on a panel of scientists asked to discuss before television cameras the expected scientific and technical advances of the next 50 years. When I suggested that we would have manned space satellites, and even trips to the moon, before the year 2000, the distance between me and my four fellow panelists grew dramatically. They did not simply disagree with this particular prediction, which might have turned out wrong: they refused to participate in predicting that any such revolutionary achievements were possible in the next fifty years. I asked them whether in 1900 they would have predicted heavier-than-air flight, or radio, or the dominance of the automobile. No one mentioned potential advances in genetics or integrated circuits—in these areas I saw no further than my colleagues.

In looking forward, our time estimates, it seems, are often too short on a time scale of years and too long on a scale of decades or centuries. I myself would never have imagined in 1974 that in 1980 there would still be so little public acceptance of the reality of the energy crisis and of the need for energy conservation as well as an active, constructive program. Many of us have been foolishly optimistic about the rate of progress toward some solution of this crucial problem. Still, technical and social revolutions of enormous magnitude, as the human habitation of space would be, have taken place within our lifetime. Some are unexpected; this one seems to me inevitable.

When people are moving in and out of space on the Shuttle, and when other people are permanently occupying the Soviet Salyut and its descendants, the change will begin. So long as these capabilities continue and grow, space

will be the frontier in the literal sense of the word.

Space is the empty place next to the full place where we live. I believe we will be true to our nature and go there.

References

Arnold, J. R. 1979. Ice in the lunar polar regions. *J. Geophys. Res.* 84:5659–67.

Arnold, J. R., and M. B. Duke, eds. 1977. Summer workshop on near-Earth resources. *NASA Conference Publication 2031.* Houston: Johnson Space Center.

Bender, D. F., R. S. Dunbar, and D. J. Ross. 1979. Round-trip missions to low delta-V Asteroids and implications for material retrieval. In *NASA Report SP-428, Space Resources and Space Settlements,* ed. J. Billingham.

Bekey, I., and H. Mayer. 1976. 1980–2000: Raising our sights for advanced space systems. *Aeronautics and Astronautics* July, 34–63.

Bielefeld, M. J., R. C. Reedy, A. E. Metzger, J. I. Trombka, and J. R. Arnold. 1976. Surface chemistry of selected lunar regions. *Proc. Lunar Sci. Conf. 7th,* 2661–76.

Bock, E. H., ed. 1979. Lunar resources utilization for space construction. *Final Report, NASA Contract NAS 9-15560.* San Diego: General Dynamics, Convair Division.

Chilton, F., B. Hibbs, H. Kohn, G. K. O'Neill, and J. Phillips. 1976. Electromagnetic mass drivers and mass driver applications. *Prog. in Astronautics and Aeronautics* 57:37–94.

Criswell, D. R., and R. D. Waldron. 1978. Commercial prospects for extraterrestrial materials. *J. Contemporary Business* 7: 153–69.

Dyson, F. 1979. *Disturbing the Universe.* Harper and Row.

Gaffey, M., and T. B. McCord. 1977. Mining outer space. *Technol. Rev.* June, 50–59.

Glaser, P. E. 1977. Solar power from satellites. *Physics Today* Feb., 30–38.

Haskin, L. A., and D. J. Lindstrom. 1979. Electrochemistry of lunar rocks. Paper 79-1380, 4th Princeton/AIAA Conference on Space Manufacturing Facilities, Princeton. (Summer Study 1978).

Helin, E. F., and E. M. Shoemaker. 1977. Discovery of Asteroid 1976AA. *Icarus* 31: 415–19.

O'Leary, B. J. 1977. Mining the Apollo and Amor asteroids. *Science* 197:363–66.

O'Neill, G. K. 1975. Space colonies and energy supply to the earth. *Science* 190:943–47.

——. 1978. *The High Frontier: Human Colonies in Space,* 2nd ed. Bantam Books.

Rao, D. B., U. V. Choudary, T. E. Erstfeld, R. J. Williams, and Y. A. Chang. 1979. Extraction processes for the production of Al, Ti, Fe, Mg and O from nonterrestrial sources. In *NASA Report SP-428, Space Resources and Space Settlements,* ed. J. Billingham.

Shoemaker, E., J. G. Williams, E. F. Helin, and R. F. Wolfe. In press. Earth-crossing asteroids: Orbital classes, collision rates with earth, origin. In *Asteroids,* ed. T. Gehrels.

Taylor, S. R. 1975. *Lunar Science: A Post-Apollo View.* Pergamon.

Watson, K., B. C. Murray, and H. Brown. 1961. The behavior of volatiles on the lunar surface. *J. Geophys. Res.* 66:3033–46.

[The following information was subsequently received for the record:]

Questions of the Committee and the Answers Thereto

Question. In your judgment are there any insurmountable technological impediments to the future exploitation of extraterrestrial resources?

Answer. None whatever.

Question. In your judgment what is the earliest date at which the United States could expect to begin the exploitation of extraterrestrial resources?

Answer. With a reasonable national commitment within ten years after the STS (space shuttle) becomes available.

Question. How soon should the United States begin planning for the exploitation of extraterrestrial resources?

Answer. Planning, and small-scale research funding, should begin now.

Question. Which of the celestial bodies—the moon, the near earth asteroids, or others—is the most promising prospect for early exploitation of resources?

Answer. The moon comes first in my view, though near-earth and other asteroids may be as important (or more important) in the long run. The reasons are (1) the moon is close, and always accessible, and (2) our knowledge of it is far more complete.

Question. What is your view as to the importance of extraterrestrial resources to the United States as compared with the importance of other resources such as seabed resources, substitutions derived from new technology?

Answer. This is the hardest question you have asked. I believe the materials problems of the U.S. and the world should be a major concern of the Congress. All these avenues should be pursued. It is my belief that extraterrestrial resources will in the long run—on a time scale of a century or so—be more important than any terrestrial resource. On a time scale of 10–20 years the reverse may be true.

Question. Is the Celestial Bodies Agreement too far in advance of science and technology for the exploitation of solar extraterrestrial resources?

Answer. I am inclined to think so. I get the impression that the negotiators, especially the U.S. team, did not believe that practical exploitation of extraterrestrial materials was important, or would come soon. Article XI and the "common heritage" phrase may not inhibit exploitation, but this seems not very clear to me.

Senator Stevenson. Thank you. Mr. Bock.

Mr. Bock. Mr. Chairman, it's a pleasure to be here. I'm appearing as a representative of General Dynamics Corp., which is neither a proponent nor opponent of the Moon Treaty. I would like to request that my written statement be included in the hearing record.

My testimony regarding the treaty concerns the feasibility and potential use of lunar resources as construction materials.

In April 1978, the Convair division of the General Dynamics Corp. initiated a 10-month study for the NASA Johnson Space Center entitled "Lunar Resources Utilization for Space Construction." I was Convair's study manager and devoted full time to assessing potential uses of lunar material and implementation scenarios. The study included an evaluation of techniques for collecting materials, their separation into enriched ores, processing and refining materials into useful elements, and manufacturing industrial feedstocks.

We found that by taking advantage of the lunar environment the reduction of lunar soil into feed stocks is certainly feasible and potentially practical.

I think the discussion this morning by Senator Schmitt adequately covered the material contained in the body of my prepared statement. I would like to summarize by saying that based on our study results, I'm convinced that a lunar materials production facility could be developed. This facility could provide useful construction feedstocks and could be reliably operated with a reasonably low number of supervisory and maintenance personnel. It is technically feasible.

I'm also convinced that as our activities in space increase, it will become economically desirable to use extraterrestrial materials at some time during this growth. With these materials, it's possible to support a broad range of ambitious scientific, Earth service, and industrial space activities.

The Lunar Resources Utilization for Space Construction study found that useful industrial feedstocks can be obtained using lunar material. We found that the best extraction and manufacturing processes are different from those commonly used on earth and take advantage of the lunar environment. Many of these processes have been experimentally verified or have seen limited commercial application. Most significantly, attractive operations are available for lunar material processing.

As we expand our space activities, we will reach a point where use of lunar materials may become very desirable. We most certainly will possess the technical ability to use extraterrestrial resources effectively.

Thank you.

[The statement follows:]

AGREEMENT GOVERNING THE ACTIVITIES OF STATES ON THE MOON AND OTHER CELESTIAL BODIES

Statement of Mr. Edward Bock,
Project Engineer at the Convair Division of General Dynamics Corporation.

Mr. Chairman, Senators, ladies, and gentlemen, it is a pleasure to be here. I am appearing as a representative of General Dynamics Corporation, which is neither a proponent nor opponent of the moon treaty. My testimony regarding the moon treaty concerns the feasibility and potential use of lunar resources as construction materials.

In April 1978, the General Dynamics Convair Division initiated a 10-month study for NASA's Johnson Space Center entitled *Lunar Resources Utilization for Space Construction.* I was Convair's Study Manager and devoted full time to assessing potential uses of lunar material and implementation scenarios. The study included an evaluation of techniques for collecting lunar materials, their separation into enriched ores, processing and refining into useful elements, and manufacturing industrial feedstocks. We found that by taking advantage of the lunar environment, the reduction of lunar soil into feedstocks is certainly feasible and is potentially practical.

The surface of the moon is characterized by large dark areas, designated Maria, and light-colored areas generally a kilometer higher in elevation than the Maria. These highland areas are severely cratered as a result of meteorite impacts. Chemical analyses of surface and slightly subsurface soil and rock samples have been performed on material collected by six Apollo and two Luna spacecraft.

Composition of the lunar crust is somewhat similar to that of the earth. Oxygen and silicon comprise the major elements, and at least eight of the ten most abundant elements in the earth's crust are also among the most prevalent in the lunar crust. Of the ten most abundant earth elements, shown in Table 1, only hydrogen (at about 50 parts per million) exists in only trace quantities on the moon.

A distinguishing characteristic of the lunar crustal surface is its relatively homogeneous composition as compared to earth. While there is some distinctive difference in composition between Mare

Table 1. Earth and lunar crustal compositions.

Earth Rank	Element	Earth PPM/Wt	Moon (PPM/Wt)	
			Mare	Highlands
1	Oxygen	466,000	417,000	446,000
2	Silicon	277,000	212,000	210,000
3	Aluminum	81,300	69,700	133,000
4	Iron	50,000	132,000	48,700
5	Calcium	36,300	78,800	106,800
6	Sodium	28,300	2,900	3,100
7	Potassium	25,900	1,100	800
8	Magnesium	20,900	57,600	45,500
9	Titanium	4,400	31,000	3,100
10	Hydrogen	1,400	54	56
11	Phosphorus	1,050	660	500
12	Manganese	950	1,700	675
17	Carbon	200	100	100
20	Chlorine	130	26	17
21	Chromium	100	2,600	850

9135-24

and highlands soils, particularly with respect to titanium, iron, and aluminum, there is little variation from location to location within each of the two areas, as determined by the limited soil analyses conducted to date.

Unlike on earth, no concentrations of specific minerals have been found on the moon. For example, while the carbon content of the earth's crust is only twice that of the moon's (200 ppm versus 100 ppm), enormous deposits of nearly pure carbon (coal) occur in many locations on earth, while the moon carbon appears to be uniformly distributed over the entire lunar surface. Thus, except for very few elements, there does not appear to be any preferable location for mining insofar as concentration of specific elements is concerned. An extensive geological survey of the lunar surface to locate possible ore bodies is warranted before initiating major mining operations.

As Dr. Arnold has described in his testimony, the lunar surface consists of finely divided grains of metal silicates. Elements available in lunar material are identified in Table 2. The oxygen, silicon, glass, and metals that comprise these materials can be converted into useful products such as rocket propellants (liquid oxygen), photovoltaic cells (refined silicon), and construction materials (glass, aluminum, steel, etc.). Many alternatives exist for accomplishing this conversion and I'd like to briefly describe some of them.

Material Collection — Mining the moon is akin to surface mining in a sandy desert. A lunarized skip loader and a couple of dump trucks can easily dig up and transport 500 tons per earth day to a central processing facility. Selection of a suitably flat mining site should permit use of remotely controlled and highly automated moon moving equipment.

Mechanical Separation — By taking advantage of the absence of a sensible atmosphere and low lunar gravity, dry processes such as magnetic and electrostatic separation can be employed to obtain desired materials. Free iron particles amounting to 0.15 to 0.20 percent by weight are contained in lunar soil. Magnetic separation of 500 tons per day could recover one ton of iron a day with no further processing. Free glass particles, created by meteoric impact, can be separated electrostatically. Thus, two useful structural materials (iron and glass) can be obtained simply by collecting and mechanically separating lunar soil. Electrostatic methods can also be used to concentrate lunar materials rich in specific metals such as aluminum, iron, or titanium.

Processing — The lunar surface environment is radically different from that of earth, being esssentially anhydrous and characterized by a high vacuum. This environment, combined with the very low and widely dispersed amounts of crustal hydrogen and carbon must exert a significant effect on the selection of lunar material recovery processes.

When one examines the history of metallurgy on earth, it is immediately evident how profound

Table 2. Lunar materials available.

		Percent by Weight		
	Elements	Mare	Highlands	Basin Ejecta
Principal Reqts For Construction	Oxygen	39.7-42.3	44.6	42.2-43.8
	Silicon	18.6-21.6	21.0	21.1-22.5
	Aluminum	5.5- 8.2	12.2-14.4	9.2-10.9
	Iron	12.0-15.4	4.0- 5.7	6.7-10.4
Other Useful Materials of ≥0.1% Availability	Calcium	7.0- 8.7	10.1-11.3	6.3- 9.2
	Magnesium	5.0- 6.8	3.5- 5.6	5.7- 6.3
	Titanium	1.3- 5.7	0.3	0.8- 1.0
	Chromium	0.2- 0.4	0.1	0.2
	Sodium	0.2- 0.4	0.3- 0.4	0.3- 0.5
	Manganese	0.2	0.1	0.1
	Potassium	0.06 - 0.22	0.07 - 0.09	0.13 - 0.46
Trace Elements Useful in Processing & Manufacturing	Hydrogen, Carbon, Nitrogen Fluorine, Zirconium, Nickel			100 ppm
	Zinc, Lead, Chlorine, Sulfer, Other Volatiles			5 to 100 ppm

18108729J9567

66-705 O - 80 - 11

the effect of earth's environment was on the development of the art and science of metallurgy. Man first found native gold and meteoric iron in their free state and learned how to work these malleable metals. Then the more easily smeltable metals were refined as man discovered that heating their ores in a reducing environment (burning in a wood or coal fire) would permit the recovery of copper, zinc, and tin. Undoubtedly, these developments were initially the result of fortuitous accidents rather than deliberate design. To accomplish them required the availability of both concentrated ores and supplies of combustible fuel.

As technology developed, more sophisticated methods were developed to win the more obdurate metals from their ores. In addition, the discovery of enriched ore bodies permitted more efficient recovery of their metals. Available water supplies and chemicals were employed to leach and concentrate the desired metals, and additional sources of energy were developed to effect the reduction of metallic compounds by thermal, electrical, and chemical means.

The moon presents an entirely different combination of environments: little or no water, hydrogen, and carbon; no fuel; and no atmosphere to sustain combustion. Solar energy can, however, be effectively harnessed on the moon and in space. Since man cannot efficiently take earth's environment with him once he escapes his planet, he must free his thinking from earth's bounds and seek to exploit whatever new environment he finds himself in if he wishes to sustain himself there.

Table 3 identifies some candidate processes that are adaptable to the lunar environment. Preliminary laboratory experimental work has been successfully conducted on the direct electrolysis of simulated molten lunar soil. As shown in Figure 1, solar energy is concentrated to melt material and photovoltaically converted to provide electrical power for electrolysis. During electrolysis, oxygen is released at the anode and metals and silicon are released at the cathode. Theoretically, a specific metal can be recovered by selective electrodeposition at predetermined voltage levels.

Another potentially attractive theoretical technique for processing and/or refining is volatilization of lunar soil and fractional distillation. This method requires high temperatures (solar concentrators) and the hard vacuum conveniently supplied by the lunar environment. Molten lunar soil can also be reduced by methane, followed by electrolytic separation. This four-step experimental process, developed by Aerojet General for post-Apollo lunar missions, is especially suited to obtaining oxygen. The methane, which is fully recovered by this process, must be initially imported from earth. Methane and oxygen are excellent rocket propellants.

It is not currently clear which of these techniques will be best suited to lunar material processing. It is encouraging, however, that so many attractive options are available. Additional technology development and end-product material requirements will determine the most appropriate processing method.

Table 3. Material extraction and manufacturing processes adaptable to luner and space environment.

Separation Processes	Environmental Compatibility
Magnetic	Dry processes
Electrostatic	Low, zero & controlled gravity
Centrifugal	
Metal Extraction Processes	
Melting & Electrolysis	Solar energy
Vacuum metallurgy	Vacuum
New techniques	
Metal Shape Production Processes	
Vapor deposition	Solar energy
Melting & casting	Vacuum
Powdered metallurgy	

21029135-26

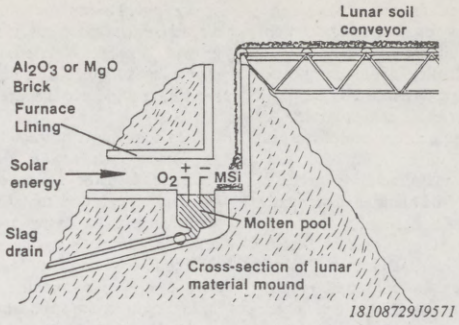
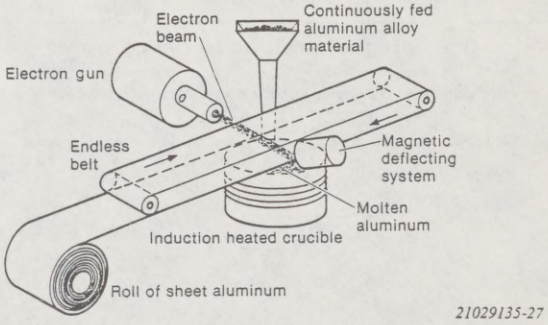


Figure 1. Proposed lunar material melting facility.

Stock Manufacture — Most manufacturing techniques on earth, such as those employed in steel mills, use large quantities of hydrocarbon fuels, as well as water and air for cooling. Once again, efficient manufacturing on the moon or in space must be accomplished without consuming these abundant earth resources and by taking advantage of the local environment.

Metal fabrication can be achieved by casting and sintering into individual parts or by physical vapor deposition via electron beam evaporation to obtain sheets. This continuous electron beam vapor-deposition process is currently being used to coat steel sheets with a protective aluminum coating. By vacuum-depositing aluminum onto a moving endless belt with a non-stick refractory coating, as shown in Figure 2, continuous sheet stock can be produced. This process is equally applicable to other metals and to glass. Experimental work has been done to show that high-rate physical vapor deposition of metals and alloys with excellent mechanical properties is feasible. This electron beam vapor-deposition technique can also be used to manufacture plate stock. Other common construction shapes (such as wire, tubing, and I-beams) can be fabricated from sheet or plate stock by slitting, forming, and electron beam welding.

Since native glass is abundant in lunar material, its use as a structural material was investigated. Glass can be manufactured as filaments, plates, solid bricks, or into foamed shapes. An inexpensive lunar construction material similar to prestressed concrete may be feasible by combining



Similar technique proposed for other metals

Figure 2. Aluminum sheet production using continuous vapor deposition.

tensioned glass filaments and foamed glass. A continuous automated process for producing foamed glass parts is described in Figure 3.

Semi-automated production of silicon photovoltaic cells is currently being developed by Department of Energy's low-cost solar cell program. A second generation of this equipment, coupled with an effective method of silicon ribbon crystal growth, could provide a manufacturing process that is readily adaptable to the lunar environment.

None of these material collection, separation, processing, and manufacturing techniques I have mentioned is labor intensive. Each can be highly automated and requires very few consumables that must be supplied from the earth. I am convinced that a lunar materials production facility could be developed. This facility could provide useful construction feedstock and could be reliably operated with a reasonably low number of supervisory and maintenance personnel. It is technically feasible. I am also convinced that, as our activities in space increase, it will become economically desirable to use extraterrestrial materials at some point during this growth. With these materials, it is possible to support a broad range of ambitious scientific, earth service, and industrial space activities.

In summary, the *Lunar Resources Utilization for Space Construction* study found that useful industrial feedstocks can be obtained using lunar material. We found that the best extraction and manufacturing processes are different from those commonly used on earth, and take advantage of the lunar environment. Many of these processes have been experimentally verified or have seen limited commercial application. Most significantly, attractive options are available for lunar material processing. As we expand our space activities, we will reach a point where use of lunar materials may become very desirable. We most certainly will possess the technical ability to use extraterrestrial resources effectively.

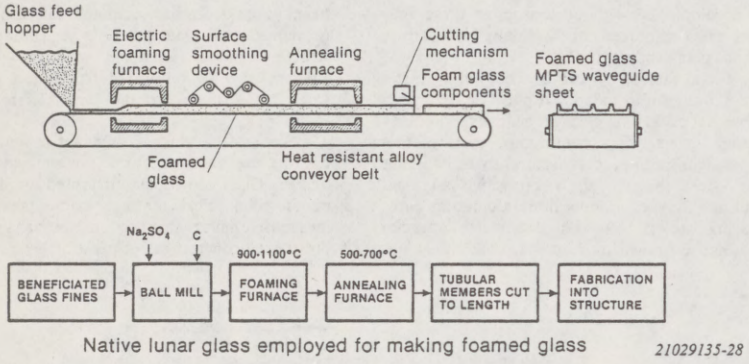


Figure 3. Foamed glass production using a continuous automated process for structural components.

[The following information was subsequently received for the record:]

QUESTIONS OF THE COMMITTEE AND THE ANSWERS THERETO

Question. In your judgment are there any insurmountable technological impediments to the future exploitation of extraterrestrial resources?

Answer. I know of no insurmountable technical obstacles.

Question. In your judgment what is the earliest date at which the United States could expect to begin the exploitation of extraterrestrial resources?

Answer. 1990. The design, development, and operation of suitable space transportation system elements will require approximately 10 years, as did those for the Apollo Program. In addition to the Space Shuttle, an orbital transfer vehicle and lunar lander are required (as a minimum) to exploit lunar resources. Exploitation of astrodial resources requires more advanced orbital transfer vehicles, with at least a 10 year development schedule.

Question. How soon should the United States begin planning for the exploitation of extraterrestrial sources?

Answer. Immediately. A remote survey of lunar resources should be conducted from lunar polar orbit as soon as possible. Development of transportation and infrastructure elements capable of supporting a broad spectrum of space activities, including exploitation of extra-terrestrial resources, should also be initiated at once. These elements include: space station modules, power systems, and propellant storage depots.

Question. Which of the celestial bodies—the moon, the earth asteroids, or others—is the most promising prospect for early exploitation of resources?

Answer. The moon. Lunar resources are more accurately known, and the orbital mechanics associated with their exploitation can be more easily accommodated with current space transportation technology.

Question. What is your view as to the importance of extraterrestrial resources to the United States as compared with the importance of other resources such as seabed resources, substitutions derived from new technology?

Answer. I think that eventually extraterrestrail resources may be far more important than these alternatives. Use of extraterrestrail resources for in-space construction of large earth services satellites is one application for which seabed resources and substitutions are unlikely to compete. Utilization of extraterrestrial materials for applications on earth may also prove to be economically attractive. Innovative techniques for inexpensive delivery of space processed materials down through Earth's atmosphere have been proposed by qualified scientists. If these techniques prove to be feasible, and expansion of U.S. space activities encompasses technology permitting astroid retrieval, then inexpensive resources obtained from space will be a reality.

Question. Is the Celestial Bodies Agreement too far in advance of science and technology for the exploitation of solar extraterrestrail resources?

Answer. No. I do not think an agreement governing states' activities in space associated with resources exploitation is premature. That this agreement constrains the organizational structure to be used by states in exploiting these unlimited resources is what I question. I can understand why a Socialist State, or Third World States lacking in space technology would support the treaty in its present form—but what would the United States achieve by being a party to this treaty? We limit any future extraterrestrial resource activities to Government. I think retaining an option permitting commercial space activities may be in our Nation's best interests.

Senator STEVENSON. Thank you. What scientific and technological activities should the government be undertaking to put the United States in a timely position to exploit extraterrestrial resources?

Dr. ARNOLD. There are two kinds of studies that it seems are very much needed now. One: the specific exploratory studies. In the case of the moon, that means a mission dear to my heart, the Lunar Polar Orbiter. This is a geochemical and geophysical survey study. It seems essential.

In the case of the asteroids, which we would talk about more if we had more time, there are a lot of Earth-based studies such as those carried on now at Cal Tech which need to be supported more

fully and broadened to find and characterize the most interesting objects.

The thrust of both of these things would be: What is out there? How available is it? So that any technological planning is informed planning.

Let me give one really idiot example. The statement is made in the literature there are no concentrated ores on the moon. We have no basis for that statement. We've been in six or seven places. If you went to the same number of places on Earth you would be unlikely to encounter ores, too. That's one example of our ignorance.

The second thing that needs doing is the study both in theory and at the bench of processes, ideas for the kinds of industrial processes which will use the attributes of space, especially vacuum, zero G, things of that kind, in combinations that have not yet been tried on Earth.

There are ideas about this. There are dedicated young people thinking about them, but very little actual concrete demonstration so far. I think both of these things can be done at modest cost.

Senator STEVENSON. Mr. Bock?

Mr. BOCK. A good example of the unique processing techniques referred to by Dr. Arnold is volatilization and fractional distillation of lunar materials. This process offers a potential method of directly separating lunar materials into feedstocks. It's not a technique we have much experience with on Earth since it employs concentrated solar energy to melt and vaporize rock. It's an interesting concept since it takes advantage of the particular lunar environmental attributes of intense solar illumination, vacuum, and one-third Earth's gravity.

Senator STEVENSON. In a rough way, can you give us some idea of what it will cost to exploit these extraterrestrial resources?

Mr. BOCK. In the study which we performed, we were specifically asked to evaluate construction of solar-power satellites in space using lunar materials, and compare their cost with similar satellites manufactured on Earth and transported into space. I can summarize our results by stating that the nominal cost estimate comparison showed the lunar resources option to be potentially attractive.

Keeping in mind that cost estimates looking 20 years into the future exhibit a high degree of uncertainty, I don't think I can say with absolute certainty that it will be less expensive to use lunar resources, but the trends are certainly that way.

Construction of solar-power satellites, which we evaluated, represents a very large scale manufacturing activity. I think that a more modest beginning of lunar resources utilization will pay off with much lower investment. I can't cite a specific number, but once we establish a scientific base on the Moon and start expanding our lunar activities, we will find a lot of practical things to do with lunar materials that will be much more cost-effective than transporting all our construction materials up to the Moon from Earth.

Senator STEVENSON. For applications in space?

Mr. BOCK. That's what we evaluated in our study. Other people have looked at applications which involved processing materials on

the Moon and returning them to Earth but our work was limited to in-space applications.

Dr. ARNOLD. My credentials for economic and cost analysis are slight, but one example that has been written up which I think is very interesting is the possibility of using asteroidal metal, nickel-rich steel, directly on the Earth. We have in our laboratories chunks of meteorites that come from asteroids which are already reduced to steel.

It was commented that an Earth-approaching asteroid a kilometer in diameter contains as much steel as the world produces in 20 years. Roughly $1,000 billion worth. If it's the right kind of iron nickel object, it has much more dollar value than that in gold, platinum, and other precious metals, which people seem to have on their minds now.

It does seem again to be technically imaginable to put those things to use on Earth with advantages for the environment, with advantages of freedom from the localization pattern of resources on Earth where South Africa and the Soviet Union have the gold and some other country controls chromium and so on.

Extraterrestrial resources are there for everyone and technologically advanced countries should be in there early. That is the direction in which these ideas go.

Senator STEVENSON. How would such an asteroid approaching the earth be mined?

Dr. ARNOLD. We will get perhaps farther away from solid base as we go, but the ideas seem to be straightforward. One has solar heat in space in unlimited abundance on any scale you want, uninterrupted. Solar energy on Earth is plagued by the fact that the Sun isn't always shining. Once you get away from earth, it's always there.

The way people have thought about these problems up to now is simply to take a large object and bring it into earth orbit by some clever techniques, and then as far as mining it is concerned, you have to slice it up. This is done with solar heat. You vaporize a cut through it.

This should not be taken as a well-developed, patented, proven way of doing things. We have no experience at this sort of thing. But there is every reason to believe these very simple methods will work.

Senator STEVENSON. They are technically feasible.

Mr. ARNOLD. Yes.

Senator STEVENSON. Economically?

Mr. ARNOLD. Economically I think the study that Bock conducted is the most careful and most recent of several studies and I yield to him about those matters. As to the things we are talking about here—mining extraterrestrial materials, you heard Senator Schmitt express himself and I agree with what he said.

I think it's pretty hard to find studies, careful technical studies, of the economics at this moment. They ought to be made.

Senator STEVENSON. And Mr. Bock, do you have any feeling as to whether this treaty would increase the uncertainty which has been cited for business and, therefore, discourge investment or increase it as others have suggested?

Mr. BOCK. Let me restate the position of my employer, General Dymanics Corporation, that they neither oppose nor are proponents of the treaty.

Personally, I feel the treaty unacceptably increases the investment risk associated with successful commercial exploitation of extraterrestrial materials. I also feel, as a space advocate, that we have seen a considerable slowing of our progress in space since the Apollo program, and one thing which might get our space activities going forward again is the capability of the free enterprise system to revitalize our space program.

Once we have a transportation system which gives us reliable transportation in space, I think commercial space activities could give us the impetus we need to go forward.

To limit that impetus by restricting our ability to utilize lunar materials and other space resources in commercial activities, I think is going to hinder our progress.

Mr. ARNOLD. Let me comment, if I may. I, like Ed, have been both a scientist and advocate in this area for a long time. I have come to realize, as one who flew experiments in the Ranger program in the early 1960's, that we scientists can't realistically expect the taxpayers or their representatives forever to support the activities that excite us so much.

I think if space is to realize its full potential, there has to be some in-go as well as out-go. This is an area where that opportunity really offers.

One more thing. I think the challenge of the space frontier is something that speaks very directly to the American heritage. The geographic frontier of the United States has pretty well been enclosed on the surface of the finite Earth. The intellectual, moral effect of activating and moving into this thing is so important for the kind of country we are, and want to be, that we want to be sure to do everything we can to create the conditions that make that happen.

So, I would look on the Moon Treaty from this point of view and end up where Ed Bock is as far as ratification.

Mr. BOCK. I would like to make one more comment. I don't mean to imply that private industry is the only reasonable way to expand our space activities, but I think at this time it's important we leave our options open until we understand the full significance of what we can do there.

To limit ourselves by effectively excluding use of commercial space ventures would, I think, be a mistake.

Senator STEVENSON. Thank you very much, gentlemen.

We will enter into the record, Dr. Arnold, your article entitled "Frontier in Space."

Our next witness is Richard G. Darman of the John F. Kennedy School of Government at Harvard University.

STATEMENT OF RICHARD G. DARMAN, JOHN F. KENNEDY SCHOOL OF GOVERNMENT, HARVARD UNIVERSITY

Mr. DARMAN. Good afternoon.

Senator STEVENSON. Thank you for joining us. Please summarize, if you can.

Mr. DARMAN. Thank you very much, Mr. Chairman.

I am delighted to have the opportunity to appear before your committee. I would ask that the prepared statement which I have submitted be included in the record, with your permission.

Senator STEVENSON. It will be entered in the record.

Mr. DARMAN. Given the serious limitation on time, let me just offer a few very summary comments.

Being one of the last witnesses, I have had the opportunity to read and hear the testimony of prior witnesses and may take this moment to comment upon what seems to me to be the thread of the prior testimony and the relationship of my own statement to it.

Notwithstanding the obvious points of difference among some of the witnesses, it seems to me there is a general line of agreement on four broad propositions.

First, celestial resource development is an exciting and potentially important new frontier for human endeavor and human development.

Second, as a strictly legal matter, the Moon Treaty does not necessarily require any particular form of regime for the governance of such development other than an international regime, subject to further negotiation.

Third, as a practical and political matter, there is a serious possibility that a celestial resource regime growing out of the Moon Treaty might rather directly parallel the deep sea mining regime negotiated in the U.N. Conference on Law of the Sea. On the other hand, there are alternative possibilities.

Fourth, uncertainty on this last point will likely have an inhibiting effect upon private investment unless—this is perhaps only implicitly argued—unless there is compensating or counterbalancing governmental involvement.

I would agree with these four propositions.

The significant points of difference among the witnesses, it seems to me, turn on an assessment of the probability of the Moon regime turning out as the U.N. Conference on Law of the Sea regime has. It's important to underline, I think, that this is a matter of practical and political probability assessment. This is not a matter of legal interpretation.

My prepared statement addresses this issue of probability. The discussion in the statement attempts to explain why the U.N. Conference on Law of the Sea has turned out as it has, and then to assess whether or not this history is likely to apply to further negotiations under a Moon Treaty.

It concludes that the probability of such an outcome is relatively high. In the interest of conserving your time and that of the committee, I would simply refer interested members to my prepared statement, recognizing that in stopping at this point, I leave you now with only the conclusory assertion and no arguement in support of it.

Thank you.

Senator STEVENSON. Thank you. You have given us a very scholarly statement. We are grateful for it. I am not clear—I haven't had a chance to read it yet—what the bottomline conclusion is.

Mr. DARMAN. That is proof that this may be an academic paper. It's a bit of "on the one hand or on the other hand." That is necessary given that this is a probability assessment.

I end up saying that the probability of the regime to be negotiated if the Moon Treaty were ratified turning out like the emerging seabed treaty is a very high probability; and the burden of arguement should be on those who would assert that this is not the case.

It is, however, not a certainty that it would end up like the deepsea mining regime. The reasons that it is uncertain, or the reasons for my conclusion concerning the high probability, I could perhaps elaborate upon, if you are interested.

Senator STEVENSON. If that is the probability, what happens if the United States does not ratify it. I assume the probability is that the regime for space is similar to the regime for the oceans.

On that basis, if the Senate refuses to ratify or the executive branch refuses to sign, then what happens? Does this process continue in any event and with a higher probability of such a regime emerging from the conference that is contemplated by this treaty?

Mr. DARMAN. I would offer only these judgments: It depends on a number of things. The outcome would depend on who else ratified the treaty. That is an element of uncertainty at the moment. If the Moon Treaty were ratified by the United States, I would expect it would be very widely ratified. Then I would expect we would have an outcome not unlike the outcome to be associated with most global conference negotiations these days. That is, either stalemate or major concession to the position that is held by the group of 77.

If the Unites States does not ratify, then the question arises: Who would ratify? How many states? How broadly based? Would the ratifiers include a set of states with the technological and financial capacity to exploit celestial resources? The next set of alternatives depends importantly on the answer to that question.

If we assume that several of the states capable of exploiting celestial resources, including the United States, were not to sign the Moon Treaty, there would be the same opportunity there is in the context of the deepsea mining regime: To rest on current international law, to proceed to exploit the resources independently, perhaps with reciprocating executive agreements among other like-minded states, and to set internatioinal law consistent not only with the 1967 Space Treaty but with the practice that we would then develop.

That is perhaps not as clear an answer as you would like. Let me turn it the other way around. It doesn't seem to me to be clear that one would have to exploit these resources in accordance with the treaty regime that would be developed if one were not a party to its development and ratification.

Senator STEVENSON. Well, would not one be free to exploit if a party to the treaty, but only after ratification with reservations which clearly established an interpretation of common heritage of mankind that gave you, the ratifying state, that right?

Mr. DARMAN. As a theoretical matter, yes, we would be free to exploit. Now, we have two practical problems at least.

One, the reservations that the United States would enter under this hypothesis would not be binding on U.S. negotiators. They would affect our view of what international law is, but if the negotiators negotiating the successor regime to the Moon agreement negotiate a regime that does not provide for free access, there is nothing in the process of reservation that affects that. The

reservations can be overtaken, superseded, by the subsequent agreement. The reason people get concerned on this point is obviously that they are concerned about the character of the successor agreement, not that they are concerned particularly about the Moon Treaty in and of itself.

I should qualify that slightly. I know you are aware that some argue the Moon Treaty itself is legally a moratorium regime. I don't hold that view. I think it is not directly but indirectly a moratorium regime, in that people presume, I think reasonably, that there would be serious limitations on access associated with the successor regime, which in turn—as a practical matter—discourages investment in the intervening period.

That is the second reason I was alluding to, that there would, in effect, be a limitation on access. Just as in the case of the deep ocean environment, private investors would be, it seems to me, rather unlikely to invest the very large amounts of capital, with the long leadtimes involved, given the large amount of uncertainty there would be in this case as to whether they would ultimately have access through which to recover the investment.

Senator STEVENSON. Having ratified the treaty would the United States subsequently be bound to accept whatever regime was created by the conference notwithstanding it disapproved?

Mr. DARMAN. I am not an international lawyer, though I have had some involvement with these issues. My understanding of the field is that we would not be bound, as a legal matter. But again one has to get to the practicalities of these issues. As a practical matter, we might end up being bound. This is the same problem as has arisen with LOS. There is one set of arguments that deals legalistically and theoretically and another that deals with the practical political and business investment issues, which may or may not conform to the legal views. And there is too little integration of these differing perspectives.

Senator STEVENSON. Well, we might have a few more questions for the record. Thank you again for your statement. My apologies for the delay.

Mr. DARMAN. Thank you for the opportunity to provide it.

[The statement follows:]

STATEMENT OF RICHARD G. DARMAN, HARVARD UNIVERSITY [1]

This statement is provided in response to the Committee's request for a discussion of the phrase "the common heritage of mankind" as found in the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, (the so-called "Moon Treaty," United Nations Doc. A/RES/34/68, 14 December 1979)—and, particularly, as related to the phrase's use in the law of the sea negotiations. (See especially the current negotiating text, Informal Composite Negotiating Text, Revision 2 ("ICNT/Rev. 2"), United Nations Doc. A/CONF. 62/WP.10/Rev. 2, 11 April 1980).

The specific "Moon Treaty" language in question is as follows: "The moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of this article"

[1] Richard G. Darman is Lecturer in Public Policy and Management at the John F. Kennedy School of Government, Harvard University. He has been associated with matters treated in this statement in several capacities: as Assistant Secretary of Commerce for Policy (1976–77); vice chairman of the U.S. delegation to the Third U.N. Conference on Law of the Sea (1977); a member of the U.S. Advisory Committee on Law of the Sea (1978–present) and of the National Academy of Sciences' Ocean Policy Committee (1979–present); and co-chairman of the International Law Association's American Branch Committee on Law of the Sea (1978–present). The views expressed are the author's personal views.

(Article 11 (1)). (Note: This article would apply not only to the moon, but also to "orbits around or other trajectories to or around it" and to "other celestial bodies within the solar system" (Article 1).)

At the outset, five points should be clarified in considering this language in relation to its use in the law of the sea negotiations:

"First, the 'common heritage' language of the 'Moon Treaty,' in and of itself, is but a vague phrase.

"Second, the cross-reference to paragraph 5, which in turn references article 18, gives further meaning to the phrase only by requiring states parties to 'undertake to establish an international regime' and by prescribing certain procedures for review of progress in the implementation of this undertaking. Although the clear presumption in favor of an 'international regime' is of substantive significance, it is fair to say that the 'Moon Treaty,' in and of itself, gives no specific definition of such a regime, and essentially leaves such definition to future negotiations.

"Third, neither the 'Moon Treaty' nor the law of the sea negotiating text refers to the other or to the other's specific domain."

A question then might naturally arise as to why the law of the sea negotiations may be linked with consideration of the "Moon Treaty." The general answer is suggested by these additional points:

"Fourth, a number of analysts—in the U.S. Congress, in the third world, in the interested professional community—believe that the law of the sea negotiations may have 'precedential' significance for other global conference negotiations and for the further development of the Group of 77's international agenda. Such analysts' reasoning rests principally upon appreciations of the policies and operations of the Group of 77, the visibility that law of the sea negotiations have in the international community (as distinguished from the United States), and the dynamics of international negotiations. In this context, "precedential" does not reflect an interpretation of necessary legal relationships; rather, it reflects judgments about the likely politics and pattern of events.[2]

"Fifth, analysts who have held the general view that law of the sea negotiations might be 'precedential' have been lent an additional degree of support by the specific language of the 'Moon Treaty.' This language includes not only the 'common heritage' phraseology, which was first used in the context of law of the sea. But it also includes a statement of 'main purposes of the international regime' that in several respects matches exactly the statements of general policies in the law of the sea text—intended to ensure 'orderly and safe development,' 'rational management,' 'expansion of opportunities,' and 'equitable sharing.' (Compare Agreement, Articles 5 and 7 with ICNT/Rev. 2 Articles 136, 140, and 150.) One ought not to make too much of this particular point, however. A counter-argument might cite conspicuous points of difference—as, for example, in the 'Moon Treaty's' omission of explicit reference to technology transfer. This then might be met by a counter-counter-argument citing possible indirect requirements for technology transfer. Such exegetical debates quickly become legalistic—and miss the basic point, which is a simple political and cultural point: At least some key drafters of the 'Moon Treaty' had the law of the sea texts well in mind."

With these five introductory points in view, one might raise—and attempt to answer—five basic questions that would seem logically to suggest themselves for consideration:

(1) What, as a theoretical matter, might the "common heritage of mankind" mean?

As a theoretical matter, the phrase might mean anything. If one were simply to take the plain English language connotation, one might suggest that all of human civilization could be construed as in some sense the common heritage of mankind—although it is not at all clear that one should then leap to the conclusion that all of human civilization must therefore be regulated by a negotiated international regime (particularly a regime that would enter into force upon ratification by only five states).

If one were to look for legal clarification, one would find that—at least for the time being—the phrase has no formal, widely accepted legal meaning. In its recent Report on this subject to the House of Delegates of the American Bar Association, the Section of International Law stated: "use of the term 'common heritage of

---

[2] See, for example, Senators F. Church and J. Javits, letter to the Secretary of State, October 30, 1979; R. G. Darman, "Statement: The Precedential Implications of the Deepsea Mining Regime," in U.S. House Subcommittee on Oceanography, Hearings: Oceanography Miscellaneous, Part 2, (GPO, Serial No. 95-44: Washington, 1978); and Statement by the representative of Mexico before the United Nations Special Political Committee, November 1, 1979: "Regarding the Treaty on the Moon * * * this Agreement provided that the resources of the moon were the resources of mankind, just like the historic decision on the resources of the seabed."

mankind' in the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies does not infer and need not lead to the use in a lunar resources regime of procedures and criteria developed in any other context. There is no generally accepted definition of this term; furthermore, this or any other term may be specially defined for the purposes of a particular text in which it is used."[3]

But if one were to look for somewhat more practical guidance, one might note, at least, the following:

"Notwithstanding the preferred U.S. legal and policy views, 'common heritage of mankind' has come to have a relatively clear and widely shared meaning among more than 80 percent of the nations of the world (the Soviet bloc plus the 119 developing states that comprise the Group of 77). And whereas the U.S. might prefer to interpret 'common heritage' as implying simply a common right of free and nondiscriminatory access, the global majority's view interprets the phrase as implying common ownership, with associated common equity interests, and common control. This latter interpretation does not allow free access to the 'common heritage'; rather, it permits access (exploration and exploitation in the case of natural resources) only in accordance with the policies, rules, and regulations of an internationally established controlling agency. Further, this interpretation tends to view common equity interests as implying not only beneficial interests in income, but also rights of common direct ownership of, and participation in, the means of production.

"Notwithstanding the fact that 'common heritage' might be applied very widely—and, at least theoretically, in widely differing ways—there has, to date, been only one 'common heritage' regime internationally negotiated in detail. That regime is the one developed in the law of the sea negotiations."

Still, it might argue that even if one accepted in the principle of common control, one need not necessarily be driven to the type of regime negotiated in the context of law of the sea. One could, for example, imagine a system: that freely guaranteed access to state-sponsored parties on a first-come, first-served basis; that, through a simple licensing mechanism, provided necessary security of tenure at specified sites; that provided for equity interests through redistribution of a portion of net proceeds; and that did so on a non-discriminatory basis through an internationally controlled agency in which U.S. interests would be adequately represented and protected. Indeed, such a system was contemplated and proposed by the United States as it entered the law of the sea negotiations—but with ultimate results that were far from this initial proposal.

(2) In what ways does the deep sea mining regime emerging from the U.N. Conference on Law of the Sea (UNCLOS) differ from the free access regime originally preferred, proposed, and expected by the United States?[4]

Among the many points of difference, the following are, perhaps, particularly significant:

The institutional arrangements for the proposed new International Seabed Authority do not protect U.S. interests to the extent intended or anticipated.—U.S. representation and power in the executive Council is not commensurate with either earlier U.S. expectations, or the power of the Soviets or the developing countries (ICNT/Rev. 2, Articles 161, 162). Dispute settlement provisions provide a narrower scope for judicial review than the U.S. thought necessary, and less protection in the selection of judges than the U.S. thought desirable (Article 190 and Annex VI, Articles 2, 3, 4, 14, 36, and 37). And there is a significant possibility that the Authority may be dominated by the one-nation-one-vote Assembly, which is the "supreme organ. * * * to which the other principal organs shall be accountable," and which has "the power to establish general policies" (Article 150, 160).

Production is directly limited and may be limited further indirectly.—There is a specified formula establishing an aggregate production ceiling with respect to manganese nodules (Article 151). There is, in addition, a quota provision to be applied to individual states (Annex III, Article 6(3)(d)). For minerals other than those found in manganese nodules, there is potential for a production moratorium (Articles 133, 137, and 151(3)). And there are many headings under which the Authority's discretion is not sufficiently circumscribed to prevent the limitation of production by the actual or potential use of such discretion.

---

[3] See Section of International Law of the American Bar Association, "Report to the House of Delegates," 1980; cf. Section of Natural Resources Law, "Report, with Recommendation, to the House of Delegates," 1980.

[4] For an analysis of the UNCLOS negotiating test (ICNT/Rev. 2) as it entered the current negotiating session, see the International Law Association's American Branch Committee on Law of the Sea, "Report," 1980.

The UNCLOS regime involves a system of mandatory technology transfer.—The UNCLOS system has some characteristics that make it less objectionable than it might have been—for example, application only to technology not available on the market; provision (although perhaps inadequate) for fair and reasonable commerical compensation; and partial limitation to a ten-year start-up period. (See Annex III, Article 5.) Nonetheless, mandatory technology transfer was strongly opposed by the U.S. in the early period of the negotiations; and it has historically been objectionable to the U.S. as a matter of philosophic and economic principle.

Access to natural resources is highly limited.—This is a function principally of provisions noted above. The potential problem is compounded by the combination of the production control and a highly discretionary selection system, which would apply as the production ceiling is approached, and which could be used to discriminate against U.S.-sponsored applicants (Annex III, Article 7).

Finally, the system deviates markedly from the original U.S. conception by establishing a globally chartered "Enterprise" in competition with state-sponsored entities on highly advantaged terms.—(See Articles 170; Annex III, Articles 5(3), 7(5), 8; and Annex IV, Articles 10(3), 11, 13.)

This last point, in combination with the previous points, allows an argument to be made that the UNCLOS regime would ultimately tend to operate as a "unitary system of negotiated joint-ventures," controlled centrally and entirely by the International Seabed Authority. Although there is no inherent reason why such a regime could not prove workable, it is obviously far different from the type of internationally coordinated—but essentially decentralized and market-controlled—regime originally contemplated by the U.S.

(3) What has accounted for the variance between the emerging UNCLOS regime and the preferred U.S. approach?

Among the many elements of explanation, the following are, perhaps, the most pertinent:

The negotiation of a widely accepted international regime necessarily involves negotiation among states with widely divergent perceived interests and preferred ideologies.—Among such states are two blocs—the Soviet bloc and the Group of 77 (now 119 developing states)—each with capacities to assure bloc cohesion, and each with operational and ideological objectives that are often antithetical to U.S. market-oriented and pluralistic interests. The U.S., being overwhelmingly outnumbered in the global negotiating context, is inclined to seek to negotiate under rules that favor "consensus" decisionmaking, rather than voting. This combination of facts necessarily leads to either statement or compromise. In the UNCLOS case, it led first to stalemate and then to U.S. compromise.

The potential exploitation of the resources in question posed a threat to states with an economic interest in land-based production.—This added an element of pragmatic interest in central production control to the ideological interest in central control. And once agreement was reached on production control, attention to the interest in equity led—almost necessarily—to practical corollaries ranging from greater central discretion to mandatory technology transfer.

Although the U.S. had a possible negotiating advantage to be derived from its superior command of technology and capital, the U.S. also had other interests—beyond deepsea mining—in the UNCLOS negotiations.—Among these were interests (judged to be security interests) in achieving treaty protection of certain traditional freedoms of navigation, as well as interests in global institution-building, and in improving "North-South" relations. (The latter tended to merge with an interest in agreement per se). To the extent that other states were able to seem to threaten these interests—a high extent, as it turned out—they were better able to extract concessions from the U.S. on the character of the seabed regime. (They were able to do so notwithstanding the fact that the formal negotiating procedures treated separable interests separately—because the overall negotiations were understood to be a "package deal," and there were informal and implicit cross-issue trading.)

Of course, one might argue that the result need not have been the emerging UNCLOS regime if the U.S. were to have weighed the relative value of the interests at stake differently.[5] But given the foregoing considerations, and given a decision to

---

[5] For perspectives on U.S. interests in UNCLOS, cf. E. L. Richardson, "Power, Mobility, and the Law of the Sea, Foreign Affairs, April 1980 and R. G. Darman, "The Law of the Sea: Rethinking U.S. Interests," Foreign Affairs, January 1978. For the author's further views on alternative seabed regimes and negotiating paths, see R. G. Darman, "Choices in the Law of the Sea Negotiations," in University of Virginia Center for Oceans Law and Policy, Ocean Policy Study 1:4, April 1978, and R. G. Darman, "U.S. Deepsea Mining Policy," in J. Kildow, ed., Current Issues in International Resource Management: Deepsea Mining (Cambridge: MIT Press, 1980).

proceed in global conference negotiations, it was probably inevitable that the alternatives should become: stalemate or major U.S. compromise.

(4) To what extent is the UNCLOS history likely to apply if the U.S. agrees to the "Moon Treaty" and is obliged to negotiate an "International Regime"?

The answer, of course, depends on many things—the most important of which, perhaps, is whether or not the negotiations are to be broadly based. If the negotiations were to be among only those states capable of exploring and exploiting space resources, the outcome might well be rather different.

But a more realistic assessment must be based on the facts that the "Moon Treaty" has arisen in the U.N. context; that it is on the agenda for the Group of 77's "New International Economic Order"; that it would not likely be ratified by the U.S. without the developing world also then ratifying; and that it is, therefore, unlikely to result in negotiations involving the U.S. without also involving a broad range of other states—with the Group of 77 importantly among them.

If the representation in the future negotiations is likely to be broadly based—as in the UNCLOS case—then the probability of the result being like the UNCLOS regime is very much higher. Among the considerations suggesting the likelihood of a similar outcome are the following:

The "common heritage of mankind" may have taken on the specific UNCLOS meaning by the time the celestial resources regime is to be negotiated.—The UNCLOS negotiations are now in what many assume may be their last substantive negotiating session. The detailed UNCLOS treaty regime could be opened for signature within a year—that is, considerably before the celestial resources regime negotiations would be likely to commence. When the UNCLOS negotiations began, the U.S. and other states were able to argue that the "common heritage" principle had only such meaning as the negotiations might give it. But once having given the principle specific meaning in UNCLOS—and, as it happens, nowhere else—the burden will have shifted: It will be necessary to show why the UNCLOS meaning is not applicable elsewhere. (This is not to say that such a showing could not be made; it is simply to note that the burden will have shifted.)

The burden of showing that the UNCLOS regime should not apply is made heavier by the fact that there are obvious similarities between the issues associated with the deep seabed area and with the moon (and other celestial bodies).—Both involve areas beyond current national jurisdiction. Both involve the exploration and exploitation of natural resources. Both involve pioneering technologies and heavy capital investment. Both could benefit from some international coordinative mechanism—even if only to provide necessary security of tenure. Both involve areas now open only to a few highly developed states. And both raise obvious, but difficult, issues of equity. The party who would argue against the proposition that "if the regime is right for seabed resources it should be right for the moon" would be, in many respects, very hard pressed. (Note: An argument that the UNCLOS regime were not right for seabed resources would be addressing a different issue.)

There is no obvious reason why one should expect, in the near term, that the Group of 77 would change its ideological preferences, its negotiating objectives, or its bloc-voting style.

On the other hand, one might point out: that in the case of the moon, there is not the evident opportunity for linkage of other interests with resource interests (although it might be invented); that there is potentially a somewhat stronger domestic representation of space industry interests than has been the case with deep ocean interests (although the space industries may also be more comfortable with government-controlled contracting); that the U.S. seems to be in the process of a conservative ideological renewal; and that, therefore, the U.S. might not compromise on a moon resource regime in the way that it has in UNCLOS. But future U.S. policy is, of course, difficult to speculate about with confidence. (Indeed, it is difficult enough to attempt to comprehend current policy.)

(5) If an UNCLOS-type "Common Heritage" regime were applied to celestial resources, would the result be desirable/workable/acceptable?

Clearly such a regime would not be desirable relative to traditional U.S. interests in market-oriented economic principles and in decentralized, pluralistic political principles. Further, to the extent that the regime incorporated stringent production controls, it would be undesirable from the perspective of global consumers and those conserned with the problems associated with the exploitation of limited global resources. And to the extent that it incorporated mandatory technology transfer provisions, it might be undesirable from the perspective of national security interests—or, if the security interests were to prevent technology transfer, it might then be undesirable from the standpoint of U.S. interests in efficient access to the resources in question.

But this is not to argue that such a regime could not be workable. It is likely that it could be—but it would necessarily involve a very high degree of governmental involvement. This involvement would be of two broad kinds:

Involvement by the Authority and States in accordance with the terms of the regime.—This would include the involvement of the new international Authority in the discretionary exercise of its presumed responsibilities for assuring that activities "shall be organized, carried out, and controlled by the Authority on behalf of mankind as a whole * * *" (ICNT/Rev. 2, Article 153, with further elaboration as noted above). It would also include the financial involvement of states parties in underwriting the start-up activities of an international Enterprise (estimated at approximately $1.25 billion in the case of the ocean mining regime). And it would mean the involvement of the Authority and Enterprise as contract managers of, or joint-venturers with, such state-sponsored entities (including all private firms) as would seek to develop the resources in question.

Involvement by the U.S. Government (and others) in protecting against risks associated with the regime.—Such involvement might take one of several forms: public subsidy, public investment protection against certain types of policital risk, or public displacement of private firms through the establishment of state-enterprise. That some such involvement would be necessary, however, seems clear. The risks associated with such a regime—and, equally important, the uncertainties created by an agreement to negotiate some such regime—are great. When viewed in relation to the lead time and capital investment requirements, such risks and uncertainties seem likely to limit private investment severely—if there is not some form of compensating or counter-balancing public involvement.

To say that a regime would be in many respects undesirable, but that it could still be made workable, does not say anything definitive about whether it should be viewed as acceptable. The question of acceptability would ultimately have to be assessed in the executive branch and the Congress in light of the full range of interests involved, and the historical context in which it might arise. The "Moon Treaty" does not directly raise this question. It is merely a first step in what could, as a theoretical matter, be one of many possible directions. And this Statement is simply a practical assessment of elements affecting the probability associated with one of those possible directions: the one that results ultimately in a regime for celestial resouces being like the regime for deep seabed resources.

In sum, the use of "common heritage" language in the "Moon Treaty" does not—as a technical, legal, or logical matter—necessarily mean that a celestial resources regime must end up like the deepsea mining regime. Yet, as a practical and political matter, it would seem that there should be a very heavy burden on those who would argue that such a result is not highly likely.

Senator STEVENSON. Our final witness is Mrs. Eilene Galloway.

STATEMENT OF EILENE GALLOWAY, HONORARY DIRECTOR, INTERNATIONAL INSTITUTE OF SPACE LAW OF THE INTERNATIONAL ASTRONAUTICAL FEDERATION

Mrs. GALLOWAY. Senator Stevenson, since my prepared statement will be in the record, I will summarize it.

I have prepared a number of options that are open to us as explained in the prepared statement. I decided upon a fifth option which is somewhat different from any that have been suggested. My interpretation of that comes from article 18 of the treaty. This provides that in 10 years after the treaty goes into effect the General Assembly will have on its agenda the revision of the treaty.

That alternative, if they follow it, would mean that the General Assembly would request the Committee on the Peaceful Uses of Outer Space to take up the revision of the Moon Treaty with its Legal Subcommittee and we would have all this happening within the same context as before. I think that is not the best place to work out an operating management agreement, although we have had a great deal of success in working out agreements in other areas concerning general principles. The other alternative is when states that are parties to this treaty—it is not the 155 nations in

the U.N. but only those states that ratified, one third can ask the Secretary General, at any time after the treaty has been in force for 5 years, to have a review conference and if there is concurrence by a majority, they would go ahead and have the conference.

But that would not be a U.N. conference because it would include only the states that are parties to the treaty. They could include people who were knowledgeable in space science and technology and others who were not. It could be a very small number, as small as 5 or 11.

And that, I think, is also not the best way in which we have had experience in the past in planning a system for an operational technological program. We do have experience in Intelsat and in Inmarsat with successful administrative arrangements.

I came to the conclusion that the United States should call a conference, should start immediately to study calling a conference, along the lines of the procedures for Intelsat and the Inmarsat agreement. If you take all of the general principles in article I of the Moon Treaty and match them with specific provisions in the Inmarsat agreement, you will see that instead of benefits being vague and general, they are specific and mean that a nation puts a share into this project and gets back from the investment according to the percentage put in. The Inmarsat agreement contains page after page of definitions and guidance for actual operating procedures.

The fact that the Moon Treaty is about natural resources, whereas Inmarsat is about navigation and Intelsat about communications, is not a fact that should keep us from assessing the experience we had in the past because our experience was not just with the subject matter but with actual setting up of an operating organization with a council, an assembly, free access of nations, representation of developing countries or the least developed countries.

All of those points that are now seen as comparable only to the Law of the Sea are subjects with which we have had experience in the past. I think the first step should be for the Department of State to create an advisory committee that represents the aerospace industry, the Department of Commerce and NASA, and then scientists and engineers should be consulted about the feasibility and timing of this space activity and the desirability of using the Moon and other celestial bodies for industrial purposes. This effort should be balanced with judgments regarding objectives to be obtained by the exploration of outer space.

There has been considerable emphasis on natural resources to the exclusion of everything else we might want to do in outer space. The economists should be consulted on the cost of the system. The relationship between space industrial activities in the near Earth space to those in deep space should be carefully assessed so we do not fail to think through the entire problem.

There should be a continuous dialog between the executive branch and the congressional committees that are interested—that is the House Committee on Science and Technology, the House Committee on Foreign Affairs, the Senate Foreign Relations Committee and this committee. All these measures should be immediately initiated and we should note that they are in implementation

66-705 O - 80 - 12

of the presidential directive on national space policy of June 1978 which states that the United States will pursue space activities to increase scientific knowledge, develop useful commercial and government applications of space technology, and maintain U.S. leadership in space technology.

Thank you.

Senator STEVENSON. Thank you. That is a worthwhile suggestion. I infer then that your own opinion now is that this treaty should not be signed and ratified by the United States?

Mrs. GALLOWAY. Well, I think after we have done this particular kind of work, one of the options is to sign the treaty and have it come to the Senate where the Senate Foreign Relations Committee will hold hearings. At that point we would decide what understandings and reservations would go into the treaty and I would be in favor of having both understandings and reservations.

I would not be in favor of the President sending directly to the United Nations only one issue, that of common heritage, because that is a delaying tactic and we will get into more involvement with the Law of the Sea. I think it would bypass the Senate and our constitutional processes and there are at least four committees deeply involved in this subject, not to mention the appropriations committees, so that I would be in favor of continuing congressional scrutiny because otherwise we would stop thinking and planning about our program. Whether we have this treaty, or do not have this treaty, whether it is one policy or the other, we still do not have a program to go with the policy.

So we need to have a program and we require funding and we are not going to think the whole problem through unless Congress gets into the act and holds the hearings.

The next place where we can have an influence is when we decide upon understandings. I would have understandings concerned only with the domestic impact on the United States. I would work out the relationship between the Government and industry and then have reservations which would have to be reported to other countries.

One of those reservations might very well be something about the common heritage of mankind, or equitable sharing, because the Senate Foreign Relations Committee wrote an understanding in its report on the 1967 treaty that this treaty does not diminish the right of the United States to do whatever it wants with benefits from its space activities.

[The statement follows:]

STATEMENT OF EILENE GALLOWAY, HONORARY DIRECTOR, INTERNATIONAL INSTITUTE OF SPACE LAW OF THE INTERNATIONAL ASTRONAUTICAL FEDERATION[1]

Mr. Chairman, and Members of the Subcommittee: The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies has become a highly debatable subject and our first inquiry should be into the reasons why strong pro and con positions have been taken on this proposed treaty. The situation is unusual, especially when we consider that four other outer space treaties, negotiated within the United Nations framework, have been readily accepted and are now in force.

A major reason is that during the nine-year period when the treaty's articles were being formulated by the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, there were four different climates of opinion

[1] This testimony represents the personal position of the author and is not necessarily connected with any organization of which she is a member.

which produced varying motives and proposals for such a treaty. The first period began in 1970–71 when Argentina and the USSR introduced proposals for a Moon Treaty. During the 1960's scientific and technological activities on the Moon led to the idea that legal problems might arise and space law should keep abreast of these developments. The United States had landed men on the Moon and returned them safely to Earth by 1969 and the Soviet Union had brought back samples from the Moon by mechanical methods. The motivation was strong to maintain the Moon only for peacefuly purposes and to ensure that destructive and harmful consequences would not occur.

The motivation for international cooperation to keep outer space from becoming an arena for conflict operated as a continuous force since the space age began.

The second period, during which the provisions of the Moon Agreement were negotiated, began in 1972–73 when developing countries expressed concern over the likelihood that natural resources on the Moon and other celestial bodies would be exploited to their disadvantage. By this time, lunar exploration by the United States and the USSR had practically ceased so that the problem was no longer primarily that of providing space law in tandem with space science and technology. The result was that space law for this subject was formulated far in advance of practical space applications for Moon ventures. During this second period, the concepts of the moon and other celestial bodies being the common heritage of mankind, and eventually requiring an international regime with jurisdiction over the exploitation of natural resources, became paramount issues which were difficult to reconcile by consensus. At the same time there were other hard core issues on the agenda of the Legal Subcommittee, difficult to resolve because of basic differences in political systems: direct television broadcasting by satellites and remote sensing of the Earth by satellites. The pace of accomplishment by the Legal Subcommittee became slower than it had been during the early years of the space age.

At least by 1978 a third period emerged during which the delegates to the Legal Subcommittee were frustrated by the length of time it was taking to bring about a consensus on the Moon Treaty among all Member States. Delegates stressed their positions that either the Moon Treaty should lose its priority or place on the agenda or be concluded by agreement. The Legal Subcommittee could not reach agreement at its 1979 session but expressed hope that the full Committee on the Peaceful Uses of Outer Space would be able to bring about a consensus during its June/July 1979 meetings. This proved to be the case when on July 3, 1979 certain compromises were reached. The USSR accepted the common heritage of mankind and international regime provisions as proposed by Brazil, concepts which it had opposed since 1972. The developing countries gave up their demand for a moratorium on exploitation of natural resources on the Moon and other celestial bodies prior to establishment of an international regime. The other two issues that had held up consensus for some years were then easily resolved by adding "other celestial bodies" to the Moon and providing for the kinds of information to be reported on missions to the Moon.

An unusual procedure was adopted by the Committee on the Peaceful Uses of Outer Space at this time. Certain of the draft treaty articles required interpretation and instead of amending the text, Committee understandings were set forth in the Committee's report, and these understandings were officially included by the General Assembly by reference when adopting the treaty text. The reason for this type of action was that consensus could be achieved on a treaty text prepared by Austria and already studied by the delegates, but if it were subjected to many possible changes the emerging consensus would be imperilled.

After agreement by the Committee on the Peaceful Uses of Outer Space the draft treaty text was given consensus approval by the Special Political Committee on November 2, 1979 and then by the General Assembly, also without voting, on December 5, 1979. The treaty was recommended by the United Nations and opened for signature on December 18, 1979.

The first three climates of opinion overlapped or merged within the United Nations, although they are clearly distinguishable because they generated different motives and recommendations. The fourth psychological period, however, began in the United States with the announcement that the Committee had completed the formulation of the Moon treaty text on July 3, 1979. The first reaction was surprise because some interested people had assumed that the Moon Treaty would never achieve consensus; others were alerted for the first time to United Nations international space activities. The issues that have arisen for discussion during the past year are different from those which were ultimately reconciled within the United Nations. A regrettable aspect of the debate over issues is that much of the information published and distributed on this subject contains factual errors, short changes presentation of "the whole truth", and generally suffers from lack of an objective research base.

Without doing any research, some writers assumed that the United Nations had put something over on the United States, whereas there is a clear record that the United States achieved in the Moon Treaty all the major points of its policy as pursued by the Nixon, Ford and Carter administrations. In 1972 the United States proposed formally the concepts of the common heritage of mankind and an eventual international regime, and by 1973 the main policy outlines of the draft Moon Treaty text had been firmed into agreed and disagreed articles for discussion. Detailed records of the negotiations have been published through the years by the United Nations. A strange element in the present situation is that the opponents of some of these proposals waited for eight years before voicing their objections.

I have worked with research materials on public affairs for several decades and have never before encountered a subject about which there has been so much misinformation and misinterpretation as that on the proposed Moon Agreement. This situation can be partly explained by the fact that some of the legal principles are so general that they are subject to various interpretations, and the situations to which some provisions apply are so far into the future as to invite speculation. But the speculation always seems to be pessimistically on the worst case basis and without taking into consideration successful international operating agreements such as those on space communications and navigation.

These hearings are, therefore, welcome in affording an opportunity for the expression of different viewpoints and predictions and, hopefully, in generating recommendations leading to a positive future course of action. These hearings, supplemented by the research studies requested by this Committee, should be of assistance in the decisionmaking process.

It is necessary to examine the options now open to us so that prudent decisions can be made for future guidance.

Option 1 whereby the United States would neither sign nor ratify the Moon Agreement is a negative approach tantamount to not planning for the future of U.S. space science and technology on exploration and industrialization involving outer space beyond near Earth orbits. It would be diplomatically awkward in view of the fact that the Moon Treaty embodies provisions proposed by the United States in 1972 and finally agreed to by other nations; furthermore, it overlooks the fact that U.S. policy prevailed on denying a moratorium on the exploitation of the natural resources of celestial bodies prior to the establishment of an international regime.

The Soviet Union opposed the concepts of the common heritage of mankind and an international regulatory regime and it was their opposition which delayed the achievement of consensus in the Committee on the Peaceful Uses of Outer Space. U.S. policy was approved and consistently pursued by three Presidents for seven years from 1972 to 1979 and if we were now to remain silent and offer no explanation, a real credibility gap between theory and practice would be created in international relations, particularly those involving the United Nations. We would not be entirely without space law for this subject as legal provisions are included in the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies which went into force on October 10, 1967. Present circumstances do not dictate a quick decision but neither do they permit drifting.

Option 2 poses a situation in which the President would sign the Agreement and send it to the Senate which would refuse consent to ratification, either by voting it down or leaving the Treaty pending indefinitely in the Committee on Foreign Relations. The treaty could be held by the Senate indefinitely unless it was decided to return it to the President. This combination of action and inaction is subject to the same criticism as Option No. 1, that is, it sidesteps responsibility and prevents analysis and planning for the future in an area which demands the combination of several elements as a basis for wise decisions: U.S. foreign affairs, international relations, science and technology, economics, the relation of Government and industry, and the impact on society.

The questions and problems which have arisen are not insoluble but they require for their mitigation and solution the concerted efforts of the most knowledgeable experts to plan with regard to achieving objectives of space policy already enacted by Congress in the National Aeronautics and Space Act of 1958, as amended. This Act provides that the United States be "a leader in aeronautical and space sciences and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere." Another act, the Communications Satellite Act of 1962, provides for the establishment "in conjunction and in cooperation with other countries, as expeditiously as practicable a commercial communications satellite system" with "global coverage at the earliest practicable date" and with "care and attention . . . directed toward providing such services to economically less developed countries and areas as well as those more highly developed * * *" In the

National Science, Engineering, and Technology Policy and Priorities Act of 1976, Congress "recognizing the profound impact of science and technology on society, and the interrelation of scientific, technological, economic, social, political and institutional factors," declared that a priority goal be "advancing the exploration and peaceful uses of outer space." It can only be concluded that Options 1 and 2 are untenable because inaction is tantamount to a decision not to implement policies enacted in three major laws. This is not to conclude, however, that decisions need to be made rapidly; in fact, there are sufficient legitimate concerns about portions of the treaty to warrant the most painstaking indepth analysis of the probable consequences of certain provisions. The most important factor in the timing of decisionmaking is the assumption that it will be many years before major space activities can be expected beyond near-Earth space. Projects involving lunar exploration and use are expensive and would involve the commitment of large resources over a scheduled period of time. We are not now faced with an emergency crisis situation demanding quick decisions, but we are confronted with the necessity of identifying interacting elements which need to be combined to enable us to think through the entire situation so that we will not be impeded from achieving space objectives in the future.

Option 3 would involve signing the Moon Agreement which would then be referred to the Senate Foreign Relations Committee for hearings. The purpose of such hearings would be to determine which of several actions should be taken, the choices being rejection, or adopting conditions for acceptance such as understandings, declarations, statements, interpretations, reservations, amendments, or explanations in the report of the Committee to the Senate.

The substance in terms of legal effects determines the exact form of response, that is, whether the impact is purely domestic or has the effect of changing contractual relations among nations. The following four forms of procedure might be considered in exercising foresight with regard to the Moon Agreement.

(1) *Comittee report.*—The Senate could advise and consent to ratification but clarify its views in statements included in the report to the Senate of the Committee on Foreign Relations. This would then become part of the legislative history and would be valuable if treaty provisions required interpretation in the future, but there would be no legal effect upon the Treaty. We have a pertinent example of an understanding in the Committee report on the 1967 Treaty on Outer Space: It is the understanding of the Committee on Foreign Relations that nothing in article I, paragraph 1 of the treaty diminishes or alters the right of the United States to determine how it shares the benefits and results of the space activities. (Treaty on Outer Space, Senate Executive Report No. 8. 90th Congress, 1st session. April 18, 1967, p. 4.)

As a practical matter the debate aroused by certain provisions of the Moon Agreement have already produced questions which can hardly be answered solely by this method, although it could conceivably be combined with other stronger measures in order to record officially a more detailed explanation of the Senate's reasons for certain decisions.

(2) *Understanding.*—An understanding or interpretation of the treaty provisions could be included in the resolution upon which two-thirds of the Senators present must agree. If there are only domestic implications, it would not be necessary to communicate them to other nations. If the treaty is substantively affected in some manner, however, U.S. understandings would be sent to other nations for their consideration. An understanding that would require communication to other nations, but would probably be acceptable, is the restatement of the Moon Agreement so that the understandings recorded by the Committee on the Peaceful Uses of Outer Space in its report of July 3, 1979 are integrated into the text of the treaty and in all places where the Moon is mentioned, the words "and other celestial bodies" are added. This type of treaty drafting would probably have been done by the Committee on the Peaceful Uses of Outer Space except that it was in a position where it was difficult to make many amendments to the Austrian draft text without endangering the consensus that had been achieved among delegates at that time. The UN Committee understandings in paragraphs 62, 63, and 65 are of a substantive nature, and although they were recognized by the General Assembly in adopting the Moon Agreement on December 5, 1979, they are part of the legislative history and not included in the treaty language. Their substance is such that if they had been U.S. Senate recommendations and understandings, they would require communication to other nations, each one of which would make its own decisions. It might be considered that consensus passage by three UN bodies—the Committee on the Peaceful Uses of Outer Space, the Special Political Committee and the General Assembly—indicates such a firm basis for support that no nation would object to inclusion of the paragraphs of understanding in the treaty text. This could become a

problem, however, if any prospective State Party objected. Nevertheless, this risk might be worth taking because of the nature of the understandings which provide:

The committee agreed that by virtue of article I, paragraph 1, the principle contained in article XI, paragraph 1, would also apply to celestial bodies in the solar system other than the Earth and to its natural resources (paragraph 62).

Following a suggestion for clarification of article I, paragraph 2, the committee agreed that the trajectories and orbits mentioned in article I, paragraph 2, do not include trajectories and orbits of space objects in Earth orbits only and trajectories of space objects between the Earth and such orbits (paragraph 63).

Following a suggestion for further clarification of article VII, the committee agreed that article VII is not intended to result in prohibiting the exploitation of natural resources which may be found on celestial bodies other than the Earth but, rather, that such exploitation will be carried out in such a manner as to minimize any disruption or adverse effects to the existing balance of the environment (paragraph 65).

If these paragraphs are not inserted in the treaty text, then their legal status requires clarification. Whether or not they are integrated into the treaty text, they raise certain questions: If the sun and asteroids are celestial bodies and the common heritage of mankind, what are the implications of their coming under the jurisdiction of a future international regime? Is paragraph 63 sufficient to protect space activities in near Earth orbits? Is it possible scientifically and technologically to comply with the intent of paragraph 65? Decisions must be made on whether to insert these understandings in any Senate resolution giving advice and consent to this treaty or include them as items in the legislative history by means of reporting in the Senate Foreign Relations Committee report to the Senate.

(3) *Reservation.*—The Senate resolution giving advice and consent to the Moon Agreement could include reservations and since these would actually effect changes in international obligations under the treaty, it would be necessary to communicate them to other States that have ratified the Moon Agreement for their considered action. The communication would probably be made to the UN Secretary General, a method adopted by France in reporting a clarification to article 3, paragraph 2 when it signed the treaty on January 20, 1980. The nature of the reservation would have to be determined after objective, indepth analysis of issues that have been raised in discussions during the past year. The major issues that come to mind are the lack of definitions; the practical implications of declaring the Moon and other celestial bodies to be the common heritage of mankind; the enumerated guidelines for an international regime when exploitation of natural resources is about to become feasible; and, particularly, some delimitation of "equitable sharing." Commercial exploitation involves step-by-step processing and at what stage is "equitable sharing" required? Additional points to consider in determining U.S. attitudes could be a reaffirmation that this treaty does not apply to space industrialization in near Earth orbit; that it does not restrict the development of solar power satellites; and that inspection permitted on the Moon and other celestial bodies does not apply to spacecraft in orbit or trajectory.

The Senate could, of course, resort to a combination of reservations and understandings, separating purely domestic matters (such as the relation of government and industry) from those that involve contractual relations with other nations. It is not possible on the basis of research materials thus far produced to determine the nature of all reservations and understandings because much of the material produced during the past year is emotional, intemperate, speculative, one-sided and often inaccurate. The fact that wide disparities have developed in interpreting treaty provisions, even by objective observers, indicates the need for additional analysis and sober appraisals. It is possible that other nations will deposit understandings and reservations and during the time the United States is considering this matter, attention should be given to any suggested interpretation or change in the provisions of the Moon Agreement.

(4) *Amendments.*—The Senate could amend the treaty and then it would require renegotiation. A protocol could be sent to the United Nations by the President and this might open the renegotiation process. The treaty could be amended among States Parties or steps could be taken to have the matter reopened on UN agendas. This option, whatever form it takes, is likely to be the most disadvantageous to the United States. If the amendments contained all the points the United States considered necessary after further objective, foresighted research, it is unlikely that other nations would agree without insisting upon provisions of their own; if the amendments consisted only of defining the term "common heritage of mankind" and elements of the "international regime", the results would be partial and not cover the totality of U.S. legitimate concerns. Furthermore, this option would represent a tactic for delay and push the Moon Treaty into a category influenced by current law

of the sea negotiations. There are unique features about outer space, the Moon and other celestial bodies as compared to problems being considered within the United Nations on the law of the sea and these should be studied if we are to formulate the most effective space law for future uses of the space environment. We cannot simply place the sea pattern on the Moon and cut the edges. While the law of the sea is a pertinent element to analyze, it has been overemphasized to the exclusion of other relevant options so that we do not have all the necessary ingredients in proportion for charting the future for the exploration and use of outer space. Before presenting my recommendations, I wish to comment on Article 18 of the Moon Agreement.

An interpretation of Article 18 of the Moon Agreement is necessary in order to clear up misunderstandings that have developed. The treaty enters into force after ratification by five nations. Ten years after that date the General Assembly must include on its provisional agenda the question of reviewing the Agreement to consider whether it requires revision. The General Assembly is to make this consideration "in the light of past application of the Agreement". No criteria additional to "past application" is provided, although presumably the evaluation need not be confined to this one aspect; however, it could be. If the General Assembly finds that conditions have changed to some appreciable extent, it would probably request the Committee on the Peaceful Uses of Outer Space (and its Legal Subcommittee) to place the question of revising the Moon Treaty on the agenda. Revision would then become the responsibility of the Committee on the Peaceful Uses of Outer Space of which the United States is a member and the United States would naturally participate in sessions whose working procedure is to take decisions by consensus, i.e., without voting. This procedure provided by Article 18 ensures that the entire matter is considered within the United Nations structure by bodies professionally staffed by experts knowledgeable in outer space matters.

The second alternative provided by Article 18 is that five years after the treaty enters into force, one-third of the States that have ratified the treaty can request the Secretary General—provided they have the concurrence of a majority of States Parties to the treaty—to convene a conference to review the Moon Agreement. If, for example, we consider this from a minimal viewpoint, then if nine nations ratify the treaty, three can request a conference if they obtain the consent of two more, which would be five altogether. Similarly, if 60 nations ratify the treaty, 20 can request a review conference and if joined by 11 more can bring about the conference. Such a conference could proceed by majority voting and would, indeed, be held outside the United Nations context since it is only convened by the Secretary General and thereafter left on its own. These States Parties need not necessarily have a connection with the Committee on the Peaceful uses of Outer Space or the United Nations Outer Space Affairs Division and could be nations lacking in capabilities in space science and technology and its practical applications. It is only this review conference that is directed to consider "the question of the implementation of the provisions of article 11, paragraph 5 on the basis of the principle referred to in paragraph 1 of that article and taking into account in particular any relevant technological developments." Article 11, paragraph 5, provides that the ratifying States "undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon—and other celestial bodies—as such exploitation is about to become feasible."

It seems unlikely that exploitation of the natural resources of the Moon and other celestial bodies would be "about to become feasible" in the next five years or possibly even in the next 10 or 20 years. States Parties to this Agreement would be violating the treaty if they tried to establish an international regime before exploitation became feasible. A period of scientific research and investigation must take place before any commercial activities can begin, and projects of this nature require a long lead time and the commitment of expensive resources. It is likely, therefore, that the General Assembly would consider revision of the Moon Agreement within the United Nations structure before a review conference could be held by States Parties to the treaty. A review conference is not restricted to considering the international regime as the treaty states that it "shall also" consider this subject, but it cannot try to establish an international regime prior to technological and economic feasibility. It should also be noted that if the Unites States becomes a party to this treaty, Article 17 comes into play and our government cannot be bound by an amendment which it has not officially accepted.

RECOMMENDATIONS

The key words used in connection with the establishment of an international regime over an area declared to be "the common heritage of mankind" are "appropriate procedures." The problem pose by the Moon Agreement is how to translate general guidelines that express value judgments into practical arrangements for the

operation of scientific and technical facilities. And beyond that, how should fair arrangements be worked out between national and international relationship?

Fortunately, there are two outstanding examples of solutions to these problems in the arrangements made for the International Telecommunications Satellite Organization (INTELSAT, 1973) and the Convention on the International Maritime Satellite Organization (INMARSAT, 1976). Although INTELSAT has been referred to in Moon Agreement discussions by name and without analyzing the INTELSAT Agreement with Annexes and the Operating Agreement, and although its purposes and organizational structure and management are also relevant to any future international agreement involving the natural resources of celestial bodies, I have chosen at this time to bring the relevancy of INMARSAT to your attention.

First, however, we should note the reasons why INTELSAT and INMARSAT are successful. Each covers a definite function whose elements can be identified and dealt with specifically. Each involves a number of countries with definite interests in the functions to be performed—the use of satellites for communications, and their use for improving maritime systems because "a very high proportion of world trade is dependent upon ships." Both multilateral agreements were worked out with due regard for general outer space principles formulated by the United Nations, but INTELSAT was negotiated outside the United Nations while INMARSAT negotiations centered from the Inter-Governmental Maritime Consultative Organization (IMCO), a UN specialized agency. There was recognition in both cases that economic and technical particalties must be efficient and fesible. Although the UN General Assembly and its committees can formulate general guidelines and play an effective coordinating role, it is not the type of organization to operate technological programs, but rather has the nature of a legislative body. Certain functions can be assigned to UN specialized agencies, such as the International Telecommunication Union (ITU) but this has not been done for the Moon Agreement nor is there a specialized agency for which this would be appropriate or one which could be established for the kinds of functions involved in commercial uses of celestial bodies. One of the difficulties we now encounter with the Moon Agreement is that it combines general value principles with the prospect of future arrangements for organization and management whose details are left indefinite. This has led to all sorts of speculation, none of which appears to me to assist in formulating a total viable plan for the uses of outer space.

Furthermore, the details of working out plans for the future, estimated to be many years in advance, have been left not to a body of States with known interests and capabilities for space industrialization but for revision either by the United Nations or by States Parties favoring general principles but not necessarily focussing on the kinds of conditions required for technological and economic efficiency. At least the kinds of knowledge and experience essential for successful operational management should not be consigned to such an indefinite state as to cause uneasiness and hinder progress, particularly when we have successful international models for solving regulatory problems.

Turning now to the Convention on the International Maritime Satellite Organization (INMARSAT) of which the United States and the USSR are members, we can see examples of the manner in which general guidelines have been interpreted in specific terms.

After considering the 1967 Treaty on Outer Space that "outer space shall be used for the benefit and in the interests of all countries", the Convention translates this into providing for "the benefit of ships of all nations through the most advanced suitable space technology available for the most efficient and equitable use of the radio frequency spectrum and of satellite orbits." After an article on definitions giving the purposes of the Convention, including the right of ownership in property, INMARSAT is established with an Organization to act "exclusively for peaceful purposes" on "a sound economic and financial basis having regard to accepted commercial principles." Financed by contributions from Members, "each signatory shall have a financial interest in the Organization in proportion to its investment share * * * "

The principle of not discriminating on the basis of nationality is worked out so that the space segment is "open for use by ships of all nations on conditions to be determined by the Council". Earth stations are wholly owned by the country in which they are located. Technical compatibility and the avoidance of significant economic harm must be maintained.

The Organization consists of an Assembly, a Council, and directorate headed by a Director General, with voting arrangements and fair representation worked out in great detail. The regulations governing inventions and technical information in Article 21 have taken into consideration information to be disclosed and that for which "The Council determines that the Organization should be able to ensure

patent protection in any country." The United Nations is appropriately involved by providing that a specialized agency, the Inter-Governmental Maritime Consultative Organization (IMCO) shall be the depository of the Convention. An annex sets forth provisions for the settlement of disputes referred to in the Operating Agreement. This separate document specifies management and administrative procedures for using satellite technology to improve maritime distress and safety systems, communication links between ships, land, crew or passengers.

If the main purposes of the international regime for the Moon and other celestial bodies, as provided in Article 11, paragraph 7, are aligned with the INMARSAT Convention, it can be calculated that "orderly and safe development" requires a similar specific approach. "Rational management" of the natural resources of the Moon and other celestial bodies would mean using suitable advanced space technology for the most efficient and economic facilities but "consistent with the most efficient and equitable use of the radio spectrum and of satellite orbits." Thus "benefits in the interests of all countries" are interpreted by INMARSAT not only as peaceful, economic and efficient, but are "to serve all areas where there is need for maritime communications." Benefits are thus defined in restricted management terms and are not open-ended and vague in their conception. Where the Moon Treaty provides for "the expansion of opportunities in the use of these resources", INMARSAT states that it will "serve all areas where there is need for maritime communications."

Subparagraph (d) of Article 7, paragraph 7, calls for "equitable sharing by all States Parties and INMARSAT has worked out this general principle by providing that financial interests of States Parties are in accordance with the proportion of their investment shares. This is in harmony with the Moon Agreement's general principle of giving "special consideration" in "equitable sharing" to "countries which have contributed either directly or indirectly to the exploration of the Moon" as well as to "the interests and needs of developing countries."

It should be noted that Congress passed an act "to provide for the establishment, ownership, operation, and governmental oversight and regulation of international maritime satellite telecommunications services", (Public Law 95–564, 95th Congress, 92 Stat. 2392, Nov. 1, 1978) in which the Communications Satellite Act of 1962 was amended to provide for U.S. participation in INMARSAT. The relation of government and industry was defined in Sec. 501(b): It is the purpose of this title to provide that the participation of the United States in INMARSAT shall be through the Communications Satellite Corporation, which constitutes a private entity operating for profit, and which is not an agency or establishment of the Federal Government.

And we should be reminded again that the COMSAT Act provides that "care and attention will be directed toward providing such services to economically less developed countries and areas as well as those more highly developed * * *."

My conclusion is that the United States should not wait for five or ten years to start work on a blueprint for space industrialization but should take the initiative in calling a conference of interested nations to draft a Convention and Operating Agreement on Outer Space, the Moon and Other Celestial Bodies, following the precedent established for INTELSAT and including lessons learned from the INMARSAT experience.

The first step should be for the Department of State to create an advisory committee representing the aerospace industry, the Department of Commerce and NASA. Scientists and engineers should be consulted to determine the feasibility, timing, and desirability of using the Moon and other celestial bodies for industrial purposes, and this should be balanced with judgments regarding objectives to be attained by the exploration of outer space. Economists should be consulted to determine the probable costs of systems. The relationship between space industrialization in near Earth space to activities in deep space should be carefully assessed so that we do not fail to think through the entire problem. There should be a continuous dialogue between the Executive Branch and Congressional committees: the House Committee on Science and Technology, the House Committee on Foreign Affairs, the Senate Committee on Foreign Relations, and the Senate Committee on Commerce, Science, and Transportation.

All these measures should be immediately initiated, noting that they are in implementation of the Presidential Directive on National Space Policy, June 20, 1978, which states that—The United States will pursue space activities to increase scientific knowledge, develop useful commercial and government applications of space technology, and maintain United States leadership in space technology.

[The following information was subsequently received for the record:]

GUIDELINES FOR THE FUTURE DEVELOPMENT OF SPACE LAW

It is important to establish criteria for the formulation of space law. As we plan for the present and future, keeping in mind patters of success and failure in the past, the following guidelines are recommended:

1. Realistic coordination of technological and economic requirements with appropriate legal measures.

2. Recognition that new treaties must be compatible with spact treaties and agreements already in force; there should be no built-in conflicts in provisions formulated for the future conduct of space activities. Implementation of this recommendation requires the codification of all space law.

3. Awareness that the nature of space law demands attention not only to UN drafted treaties but also to bilateral and multilateral agreements concluded outside the United Nations framework, e.g., the European Space Agency, INTELSAT, etc.

4. Recognition that different patterns of international space cooperation can develop with regard to relationships with the United Nations, e.g., the International Telecommunication Union, UNESCO, the World Meteorological Organization, the Food and Agriculture Organization, the International Maritime Satellite Organization, etc.

5. Attention to the fact that there are interrelationships between international space law and national laws.

6. Acknowledgement that consensus should not be achieved on compromises that are so general and undefined that widely differing interpretations can reasonable result.

7. The Legal Subcommittee of COPUOS, which has a highly successful record of accomplishment, should not be expected to formulate space treaties on every space application, and its workloads can include discussions of subjects requiring background information and clarification, particularly in integrating technical and legal matters.

Attention to the necessity of achieving universal adoption of the several major treaties which make up the body of international space law.

Senator STEVENSON. Thank you, Ms. Galloway. I regret we don't have more time.

The subcommittee is adjourned.

[Whereupon, at 1:25 p.m., the subcommittee was adjourned.]

ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

UNITED METHODIST LAW OF THE SEA PROJECT,
Washington, D.C., June 23, 1980.

WARREN CHRISTOPHER,
Deputy Secretary of State,
U.S. Deputy of State, Washington, D.C.

DEAR DEPUTY SECRETARY CHRISTOPHER: The United Methodist Law of the Sea Project [1] would like to express its strong support for U.S. signature and ratification of the recently completed Agreement Governing Activities of States on the Moon and Other Celestial Bodies, better known as the Moon Treaty. (I am enclosing copies of two earlier letters on this subject. Else M. Adjali speaks for the Women's Division of the United Methodist Church which represents over a million individuals.)

We recognize that weighing the intangible benefits of an evolving framework for peaceful relations among nations in outer space is not easy. We recognize that the time frame for commercial development of outer space makes treaty signature and ratification at this time less urgent. We also recognize that the anxieties expressed by some elements of the U.S. aerospace industry represent an immediate counterpoise.

But to refuse to sign the Moon Treaty now, having contributed to and supported its elaboration in the U.N. General Assembly would be turning our back on this country's commitment to cooperate with other nations in the further evolution of international law for outer space. This attitude will undoubtedly affect the tenor or our relations with many of these states in a number of Earth-bound negotiations.

The basis for criticizing the Moon Treaty seems especially weak: that the term "common heritage of mankind," and the four principles in Art. XI(7) of the Treaty meant to serve as a basis for the elaboration of this concept in a moon resources regime, are associated with a specific ideological focus on economic activity in the view of many Third World nations. Critics draw heavily on the analogy to the deep seabed mining discussions in the Law of the Sea negotiations.

It also seems the height of optimism to believe that rather than signing the Moon Treaty the U.S. could prevail upon other nations to renegotiate it or to negotiate one of a slightly different scope which would somehow more favorably reflect U.S. interests. First, given the publicity surrounding the Moon Treaty, it is unlikely that those nations supporting the common heritage principle will agree to abandon it. Second, once the outcome of the Law of the Sea negotiations is known and implementation of the deep seabed mining regime proceeding, nations will be well aware of whether or not they would wish to repeat the exercise. If it is not working, they will not wish to re-entangle themselves in a similar undertaking; if it is, nothing would prevent a subsequent Moon Treaty negotiation from incorporating more detailed provisions from the mining regime.

We also find that there are a number of reasons to support signature and ratification at this time and to discount the opposition based on Law of the Sea analogies:

The trade-offs in the LOS negotiations are not the same as those which will obtain in the future moon resources regime negotiagions.

The types of outer space development projected for the next half century (solar power satellite construction from lunar materials) will not entail adverse effects on earthly producers of materials who might therefore insist on price and production controls as has occurred in the LOS forum.

Since the Moon Treaty is likely to become a reality with or without U.S. acquiescence (5 nations have already signed it), the U.S. would be in a better position in the subsequent resources regime negotiations had it signed and ratified the treaty.

Pure ideology—whether based on "common heritage" principles or on free enterprise principles—has yet to prevail in any functional international agreement.

---

[1] The Project represents about 5,500 individuals around the country.

An additional protection for the U.S. in these future moon resources regime negotiations is the specification in the Moon Treaty that the interests and needs not just of the developing nations but also of those nations which have "contributed either directly or indirectly to the exploration of the moon" are to be given special consideration. This concession was obtained in the LOS negotiations only after several years of discussions.

The alternatives are exaggerated. Unless the U.S. abrogates the 1967 Outer Space Treaty, and exclusive claim to lunar resources would have to be sanctioned by some form of international consensus to provide the kind of investment security which corporations and banks require. Unilateralism will not meet the aerospace industry's concerns.

International cooperation in outer space is long-standing and there are precedents other than the LOS negotiations for the evolution of structures for the utilization and development of space, such as INTELSAT.

In addition to questions of investment security, a framework of international law will be necessary both to protect those of us on Earth from untoward environmental, safety and health consequences of lunar development and to avoid conflicting undertakings by different nations and their citizens. There is no such thing as a unilateral answer to these questions.

Finally, rejection of the current treaty would provoke unfavorable reactions from other nations and undermine the traditional support of the United States for international law as the basis for relations among states.

We urge your consideration of these views.

Sincerely,

BARBARA WEAVER, *Director.*

WASHINGTON, D.C., *June 17, 1980.*

Prof. CARL Q. CHRISTOL,
Professor of International Law and Political Science,
University of Southern California, Los Angeles, Calif.

DEAR PROFESSOR CHRISTOL: The Subcommittee on Science, Technology, and Space of the Committee on Commerce, Science, and Transportation has scheduled hearings on July 29 and 31, 1980, on the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies," frequently referred to as the "Moon Treaty." This Agreement, endorsed and opened for signature by the United Nations last December, is of great importance to the United States and the rest of the world with respect to the future use of extraterrestrial materials. It is a forward thrust in space law in an effort to keep the legal aspects of space exploration in tune with the scientific and technical development activities. Consequently, the U.S. Senate has a responsibility to examine closely this new space treaty to assess how its provisions would affect the use of the space environment, including the exploitation of extraterrestrial resources by the United States and other States.

Your manuscript, "The Common Heritage Provision in the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies" has come to the Subcommittee's attention. The "common heritage" provision of the Agreement has generated substantial controversy, and your study of it is the most comprehensive and scholarly and would make a significant contribution to the Subcommittee's hearings. Therefore, providing you have no objection, the Committee proposes that your study be printed as part of the hearings. In addition, we invite you to submit for the record any additional views you may have on the Agreement.

It is requested that such testimony and your study, ready for printing, be submitted to the Subcommittee early in August.

If there are any questions regarding this, please contact Mr. James J. Gehrig of the Committee staff at (202) 224-9351 or Mr. Gerald Kovach of the Committee's Minority staff at (202) 224-1251.

With every good wish,

Sincerely,

ADLAI E. STEVENSON,
Chairman,
Subcommittee on Science, Technology, and Space.

UNIVERSITY OF SOUTHERN CALIFORNIA,
Los Angeles, Calif., June 25, 1980.

Hon. ADLAI E. STEVENSON,
Chairman, Subcommittee on Science, Technology, and Space, Senate Committee on Commerce, Science, and Transportation, U.S. Senate, Washington, D.C.

DEAR SENATOR STEVENSON: I write to support the acceptance by the United States of the December 5, 1979 Agreement Governing the Activities of States on the Moon

and Other Celestial Bodies. In my view this treaty serves the national interests of this country.

I am enclosing a copy of my assessment of critical elements of the treaty entitled, "The Common Heritage of Mankind Provision in the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies."I request that this article be included in the record of your hearings. A review of what I have written will demonstrate why I have come to the conclusion stated above.

In brief summary, I would point out that the treaty imposes two constraints on the exploitation of the Moon and its natural resources, namely, such exploitation must be carried out for peaceful purposes only and suitable precaution must be taken against environmental detriment.

The treaty despite unfounded allegation to the contrary, does not establish a moratorium on the exploitation of the Moon's natural resources. It provides that such exploitation may be carried on by a signatory to the agreement. It allows such a signatory to prescribe the conditions under which natural and juridical persons who are under the authority of the signatory may engage in exploitative activity. Such persons pursuant to U.S. permission would be allowed to gather the natural resources of the Moon in the same manner as U.S. fishermen are allowed to harvest the fish in the ocean. In doing so they would be in compliance with the treaty.

It is also a fact that Articles 11 and 18 of the treaty make provision for a future international conference at which time the negotiators would create by treaty an international legal regime, including appropriate procedures, to govern the exploitation of the Moon's natural resources. Pending the creation of the regime exploitation would be carried out as indicated in the preceeding paragraph. Following the establishment of the regime there would be a distribution on an equitable basis to those States becoming a formal party to the regime of the benefits derived from exploitative activities. Presumably exploitative activity would be carried on by the same natural or juridical persons given permission to do so under the domestic laws of the signatory State. Thus, for the United States it would be possible either for it to authorize its national firms to engage in such activity, or any other combination of operating entities might be used. For example, were it determined to be in the national interest a joint venture between the government of the United States and private U.S. firms might be utilized. In any event it is clear that the treaty only calls for signatories to the Moon Agreement to negotiate a future regime—obviously in good faith. However, if such a regime for the implementation of the Common Heritage of Mankind principle could not be agreed to, then exploitation would continue under the terms of the Moon Agreement.

The International Law Section of the American Bar Association at its Spring, 1980, meeting, adopted a resolution in which it noted, "Understandings"as to the interpretation of the treaty. These, in my view can be justified on the ground both as an aid to clarity and as excessive caution. On the basic of my article, "The Common Heritage of Mankind Provisions in the 1979 Agreement Governing The Activities of States on the Moon and Other Celestial Bodies" I have concluded that the proposed "Understandings" in no way modify the terms of the treaty. They are welcome. But, they are not necessary since what they contain can be found within the treaty upon a close and careful reading of it taking into account, as I have, the negotiating history of the Agreement.

The treaty does not in any way derogate from the existing 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space to which the United States, along with all of the other major space-resource States, are parties. The Moon Agreement adds to the 1967 Treaty and does so with the basic purpose of enlarging the rule of law in outer space. The presence of such law, allowing for exploitative activities, will contribute to order rather than chaos, will allow exploitation to go forward in a structured fashion, and will benefit the United States and other cooperating members of the world community.

Sincerely yours,

CARL Q. CHRISTOL,
Professor of International Law
and Political Science.

Enclosure.

THE COMMON HERITAGE OF MANKIND PROVISION IN THE 1979 AGREEMENT GOVERNING THE ACTIVITIES OF STATES ON THE MOON AND OTHER CELESTIAL BODIES, BY CARL Q. CHRISTOL, PROFESSOR OF INTERNATIONAL LAW AND POLITICAL SCIENCE, UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES, CALIF.

INTRODUCTION

The Draft Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of July 3, 1979[1]* is intended to provide a more detailed regime than now exists for the Moon and celestial bodies and their natural resources. The proposed Treaty deals only with these areas and their resources. It does not have application to outer space, per se. The Treaty permits certain forms of conduct. It prohibits other forms of conduct.

The Moon Treaty has been the product of many labors. In the United States several of its most carefully negotiated provisions have been adversely criticized. Such criticisms appear to be unfounded.

Its terms, properly understood, will provide a regime supportive of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies.[2] The Principles Treaty focuses on the exploration use and exploitation of the space environment consisting of outer space, per se, the Moon, and celestial bodies. The Moon Treaty, unlike the Principles Treaty, makes specific provision for the exploitation of the natural resources of the Moon and celestial bodies. The Moon Treaty, while preserving the provision contained in Article 2 of the Principles Treaty that there may not be a sovereign appropriation of the Moon and celestial bodies, does enable defined juridical and natural persons to obtain proprietary rights in certain natural resources on and of the Moon and celestial bodies.

The new rights and duties contained in the Moon Treaty have been brought together through the adoption of the Common Heritage of Mankind (CHM) principle. Since this principle on its own account has introduced a new approach to the exploration, use, and exploitation of natural resources, there is a need to examine its meaning and utility and to compare this principle with other principles that might have been adopted respecting resource use, exploitative activities, and proprietary rights concerning natural resources. Many important values, interests, wants, and needs, require evaluation in order to comprehend the legal significance and evolving range of application of the CHM principle.

The Moon Treaty necessitates the making of distinctions between at least four different situations—all of which have factual bases and legal consequences. First, there is the difference to be noted between the spatial area of the Moon and celestial bodies and their natural resources. Second, there is a difference between the prohibition contained in Article 2 of the Principles Treaty against national, e.g., sovereign, appropriation of spatial areas and the right of legal persons to obtain property rights in certain natural resources. Third, the provisions of Articles 1 and 3 in particular of the Principles Treaty, as well as other articles, allowing for the exploration, use, and exploitation of the space environment by States must be contrasted with the rights of other legal persons to engage in such exploration, use, and exploitation. Fourth, there is a need to distinguish the characteristics of the CHM principle from such other legal principles as res nullius, res communis, and res communis humanitatus.[3]

The substantive provisions of the 1967 Principles Treaty made twenty-five references to the Moon and other celestial bodies.[4] Additionally, there were seven separate references to celestial bodies. The Treaty made no reference whatever to the natural resources of the space environment. It was an international agreement designed to deal with general principles having application to the space environment.

Events occurring in the 1960's suggested that a more detailed legal structure dealing with man's Moon and celestial body activity, including use, exploration, and exploitation, might be desirable. Influencing early proposals were the successful Moon landing by the United States in 1969, an awareness that tangible Moon rocks were being returned to Earth, the attention being given by scientists to such materials, the preliminary studies identifying the commercial uses of space materials and facilities, the knowledge that orbital positions and access to radio spectra were becoming valuable natural resources, and speculations that it might be possible to establish human habitations on the Moon. Even the temporary presence of humans would require the exploitation of available tangible and intangible resources.

---

*Footnotes appear at end of article.

The presence of an effective rule of law in the space environment depends on a wise blending of general principles with a more specific set of rules. The Principles Treaty fixed legal principles for the free exploration, use, and exploitation of the space environment as well as assuring free access to that environment. The 1979 Moon Treaty seeks to formulate a particularized set of rules and present and future processes whereby the optimum exploration, use, and exploitation of the Moon and its natural resources may take place.

The Moon Treaty contains substantive terms of immense importance to the well-being of mankind. Among its notable provisions are those making international law applicable to all activities on the Moon—including its exploration, use, and exploitation—, requiring that the Moon shall be used by all States Parties exclusively for peaceful purposes, providing that the exploration, use, and exploitation of the Moon shall be the province of all mankind, imposing on States the duty of providing notice concerning Moon activities, providing for non-discriminatory and free scientific investigation on the Moon, imposing the duty not to disrupt the existing balance of the Moon's natural environment, and affording to astronauts and other persons on the Moon all safeguards respecting their lives and their health. As early as 1972 the negotiators arrived at a consensus that national non-governmental entities, e.g., private legal persons—including juridical and natural persons—should engage in Moon and celestial body activity "only under the authority and continuing supervision of the appropriate State Party."[5]

While many of these principles are already a part of the existing international law of the space environment, the 1979 Moon Treaty has given more detail and substance to such principles.[6]

The Treaty contains a strikingly new international legal principle. It is the principle, set out in Article 11, that "The Moon and its natural resources are the common heritage of mankind." Because of its importance and relative novelty this analysis will focus primarily on the meaning of the CHM principle and what is intended to be gained by its incorporation into the international law applicable to the Moon and other celestial bodies. Inextricably linked to natural resources and CHM are concepts of property and an international regime, including the prospect of a new international organization.

The Moon Treaty, by extending the detailed rule of law to the Moon and to other celestial bodies, will afford stability to governments and to private enterprise so that worthwhile exploitative activities may be initiated. As early as 1972 the Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space (COPUOS) had taken account of "the need for economic advancement and for the encouragement of investment and efficient development" in order to assure that the resources of the Moon and other celestial bodies would become a reality.[7]

In the United States it is to be expected that such activities will be carried on by both the national and other governmental bodies and by private firms. This would follow, for example, the approach now favored in which both the national government and private enterprise engage in telecommunication activities in the space environment. With the entry into force of the Moon Treaty both States and private enterprise will be able to make informed plans relating to the exploitation of the Moon and other celestial bodies including the natural resources of such areas.

The first proposal for an international agreement providing for the detailed governance of the Moon and other celestial bodies, including the use of the CHM principle, came before COPUOS on July 3, 1970 in the form of an Argentinian "Draft Agreement on the Principles Governing Activities on the Use of Natural Resources of the Moon and other Celestial Bodies.[8] The Argentinian proponent, Professor A. A. Cocca, has treated the foregoing as a principle of law and not as a philological question nor equated to the realms of philosophy.[9] It was also his view, which is supported by Article 8 of the Principles Treaty, that the principles of property law accompanied mankind's ventures into the space environment.[10] From that date to July 3, 1979 the Legal Sub-Committee of COPUOS gave substantial attention to the drafting of a Moon Treaty containing provisions going far beyond the focused approach of the Argentinian draft.

On July 3, 1979 COPUOS, through the established process of consensus—namely, with the approval of all of the members, but without a formal vote—, adopted for submission to the Political Committee and to the General Assembly a Moon Treaty of twenty-one articles.[11] In the years between 1972 and 1977, following the request of the Soviet Union on June 4, 1971 to the General Assembly to include as an agenda item the topic of "Preparation of a Treaty Concerning the Moon,"[12] the Legal Sub-Committee considered 27 texts concerning natural resources, 15 relating to the scope of the agreement, and 19 relating to the time in which States should report information relating to space activities.[13] Annual discussions contributed to the slow emergence of consensus.

On April 3, 1978, Austria submitted to COPUOS a working paper consisting of 21 articles.[14] This document borrowed heavily on earlier drafts. In 1972 the Legal Sub-Committee had completed a draft consisting of a preamble and 21 articles that included in square brackets the provision that "The natural resources of the Moon and other celestial bodies shall be the common heritage of mankind."[15] The same square bracketed provision was contained in the April 27, 1973 "Draft Treaty Relating to the Moon."[16]

In 1974 Bulgaria submitted a draft, which contained provisions similar to those that had been formulated in 1973.[17] By 1978 the proposal read: "For the purposes of this Agreement, the Moon and its natural resources shall be considered the common heritage of mankind, which finds its expression in the relevant Agreement and in particular in paragraph 5 of this [11] article."[18] Although there were other areas of disagreement at COPUS between 1973 and 1979 on this subject, the principal obstacle centered around a provision relating to the exploration and use, including exploitation, of natural resources. Affecting a consensus disposition of this issue was the distinction to be drawn between private property and public sovereignty. Influencing these considerations were the meanings to be attributed to such concepts as "the province of mankind" and "the common heritage of mankind."

Both have been regarded as important political-legal concepts. To the extent that they have been incorporated into international space agreements they can only be treated as legal principles. As legal principles, namely, as starting points for legal reasoning, several demands have surfaced. One has been to endeavor to ascertain—as much as it is possible to read the future—what the substantive content of these legal principles will come to mean when they are applied in a work-a-day world. The acceptance in treaty form of the CHM principle will not prevent affected States from attaching different interpretations to its meaning.

THE PUBLIC SOVEREIGNTY-PRIVATE PROPERTY DILEMMA RELATING TO SPACE RESOURCES

With the transition from the exploration of the space environment to its practical use and exploitation it has become necessary to identify the legality of exploitative conduct. This is now true respecting the exploitation of the Moon and to its natural resources.

Viewed from the perspective of policy choices it would be possible to accord rights to both the Moon and its natural resources to both natural and juridical persons. The latter could include States and international bodies, both intergovernmental, such as the European Space Agency, and private legal persons endowed with a national character, such as a multinational corporation. Their respective interests could take into account security, commerce, and science, to mention only those that are of relevance here. Thus, the subject involves the interests of several international actors in both the Moon and its natural resources. The public actors are concerned with their sovereign and governmental rights and functions. The private actors seek a clarification of their rights under domestic and international law as they contemplate exploitative activities. The private actors, no less than the public actors, are concerned about property rights resulting from their efforts.

During the period since 1960, as progress was made toward the drafting of the 1979 Moon Treaty, many policy approaches were suggested. These alternatives need to be kept in mind when an effort is made to understand the conclusion reached in Article 11 of that Treaty that both "the Moon and its natural resources are the common heritage of mankind. . . ." Numerous political-legal options were available. Each would have resulted in qualitatively different rights and duties for both natural and juridical persons.

The views of international lawyers from many countries have had a substantial impact on the identification of competing policy choices. Their contributions were weighed by COPUOS and influenced the final decision to make the CHM principle a key part of the 1979 Moon Treaty.

Writing in 1962 about the expected exploitability of mineral resources, it was suggested by Jenks that "It would seem desirable to start from the principle that title to the natural resources of the Moon and of other planets and satellites should be regarded as vested in the United Nations and that any exploitation of such resources which might be possible should be on the basis of concessions, leases or licenses from the United Nations."[19] Presumably the holders of such property rights might have been both the sovereign State, public international organizations, and private legal persons. Alternative legal regimes for the exploration, use, and exploitation of the Moon and its natural resources could include such extremes as the total prohibition of both public and private space activities or, by contrast, a wholly unregulated power for public and private persons to engage in such activities. Such legal controls could take the form of specific authorizations. Or, certain

forms of conduct might have been permitted although not specifically authorized. In the event of a total absence of international legal controls States would be allowed to assert unrestricted public sovereignty. Absent a legal regime private persons would be allowed to claim unrestricted rights, including exclusive uses, which would constitute either property rights or a preferred status respecting resources. In legal terminology, the legal options would encompass the concepts or principles of res nullius, res communis, res communis humanitatus, and the Common Heritage of Mankind. Specific consequences would flow from the identification of one as opposed to an alternative approach. For example, any one of the four would be a denial of the proposal put forward by Jenks. Any one of the four would have a major impact on public and private space activity. Depending on which of the options might be adopted, States, intergovernmental organizations, and private persons would be differently governed in the exploration, use, and exploitation of the area and its resources, including uses taking on an exclusive character, e.g., having property connotations.

An alternative to the Jenks proposal for UN authority was soon put forward. In its Draft Declaration of the Basic Principles Governing the Activities of States Pertaining to the Exploration and Uses of Outer Space of September 10, 1962, the Soviet Union sought to limit the exploration and use of the space environment to States. Thus, it suggested "7. All activities of any kind pertaining to the exploration of outer space shall be carried out solely and exlusively by States. . . ."[20] One of the relevant principles in the Declaration Referred to international responsibility for damage "done to a foreign State or to its physical or juridical persons as a result of such activities."[21]

The United States advanced the view on September 11, 1962, that both States and international organizations would be "responsible for the launching of a space vehicle. . . ."[22] This position was restated in the U.S. Draft Declaration of Principles Relating to the Exploration and Use of Outer Space of December 8, 1962.[23] This proposal was put forward in the context of responsibility for launching and possible liability for damages.

In explaining the import of this proposal the U.S. representative told the legal Sub-Committee of COPUOS on April 24, 1963, that it "covered the possibility of a Government enlisting the help of a private corporation or firm, which it might authorize to carry out activities in space subject to continuing Government supervision."[24] It was pointed out that pursuant to U.S. policy, as reflected in the Communications Satellite Act of 1962, a right had been established for private firms to engage in space activity and that the principle of national responsibility for national space activities, both public and private, had been established. This legislation was intended to reassure the limited number of States which had expressed the view that international space activities should be conducted only by States that harms resulting from both private and public activity would be encompassed by a legal regime.

Thus, in September 1963, the Soviets withdrew their proposal that space activity should be carried out only by States. In commenting on the conduct of activities in space by private firms, under the supervision or control of a government, it was stated: "The Soviet delegation considers it essential to point out that in this field it would be possible to consider the question of not excluding from the declaration the possibility of activity in outer space by private companies, on the condition that such activity would be subject to the control of the appropriate State, and the State would bear international responsibility for it."[25]

These outlooks produced paragraph 5 of General Assembly Resolution 1962 (XVIII) of December 13, 1963, which provided that "States bear international responsibility for national activities in outer space, whether carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried on in conformity with the principles set forth in the present Declaration." Although the Declaration did not define "national activities" to include only public activities nor to exclude private activities carried on by nationals, the distinction drawn between "governmental agencies" and "non-governmental entities" may reasonably be construed to include private firms within the last mentioned category. This conclusion was reenforced by the negotiations and terms employed in the 1967 Principles Treaty, particularly Article 6.

Leading to the 1967 Treaty were the 1966 proposals of the Soviet Union and the United States. On June 16, 1966 the Soviets submitted to the UN Secretary-General a Draft Treaty on Principles which contained the basic terms of paragraph 5 of General Assembly Resolution 1962. It accepted the view that States would bear international responsibility for national activities in outer space or on celestial bodies "whether such activities are carried on by governmental agencies or by nongovernmental bodies corporate." Further, such private national legal entities

66-705 O - 80 - 13

were to be subject to the "authorization and continuing supervision by the State concerned."[26] Pursuant to this language Comsat "would be an 'international responsibility' of the U.S. government, which would also be responsible for its 'authorization and continuing supervision.' "[27] Although the United States did not have a comparable provision in its Draft Treaty of May 10, 1966, it did contemplate the presence of nationals engaging in space activities on the Moon, and it did not disavow its early support of private activities or the favored terms of paragraph 5 of General Assembly Resolution 1962.[28]

Both States were also in agreement that the Moon, per se, was not to be "subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means." This formulation became Article 2 of the 1967 Principles Treaty, reading "Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[29] This was intended to, and did, constitute a prohibition against the presence of national or public sovereignty respecting the spatial area of the Moon. By its language it did not deal with natural resources. It did not deal with private activities. It prohibited national sovereignty. In establishing this principle the negotiators borrowed from Article 4 of the 1959 Antarctica Treaty which prohibited national sovereignty in that area. The res communis principle, according to Ambassador Goldberg, resulted from "an attempt to create in outer space the closest analogy and that is the high seas."[30] He stated that the treaty allowed no national appropriation, and "forbids claims of sovereignty."[31]

Article 6 of the 1967 Principles Treaty contemplated that space activities relating to the Moon would be "carried on by governmental agencies or by non-governmental entities," with the latter to be subject to the "authorization and continuing supervision by the appropriate State Party to the Treaty." That this langauage was understood as allowing States to authorize private, as well as governmental, activities in the space environment was made clear in the testimony of Ambassador Goldberg before the Senate Committee on Foreign Relations. In explaining the meaning of Article 6 Senator Fulbright observed: "You mean by activities, either by Government or some nongovernmental entity. Do you contemplate private enterprise undertaking development in outer space?"[32] The former responded: "Yes, this might happen, and if it does, then the Government must bear responsibility for nongovernmental organizations. Comsat, organizations of that type."[33]

The foregoing history demonstrates the presence of an international legal regime in which outer space, per se, and the Moon and celestial bodies are not subject to national appropriation and consequently there is the absence of public sovereignty in the indicated areas. This constituted a rejection of the res nullius option and the acceptance of the res communis principle. Flowing from this principle, which had found expression in the law of the high seas, was the right of States, international organizations, and private legal persons to engage in activities in and to make use of the space environment. Since States could not exercise the prerogatives of sovereignty they could not establish property rights, in the sense of exclusive authority, over the indicated spatial areas for themselves, nor could they grant such property rights to those who were subject to their national laws. However, with the decision as set forth in the 1967 Principles Treaty to allow for the free use, exploration, and exploitation of the space environment, including free access thereto, States, international organizations, and juridical and natural persons, including private legal persons, were enabled to exploit the space environment and obtain private property rights in its natural resources.[34] Juridical and natural persons while engaged in such activities pursuant to the authority of a State would be under the control of that State. Parties to the 1967 Treaty are responsible for the conduct of such authorized persons.

The foregoing result was not preordained. Early discussions which occurred prior to the Argentinian draft Agreement of July 3, 1970 raised the issues of public and private property rights concerning both the Moon and its natural resources. Beginning in 1960 the International Institute of Space Law, a private group of international lawyers expert in the field of space law, established a working group on celestial bodies. In 1964 the working group put forward a draft resolution that provided in paragraph 3 that celestial bodies "or regions of them shall not be subject to national or private appropriation."[35] While there was support for this proposition at that time, including the reference to private appropriation, with a growing awareness of man's ability to have access to the space environment and his needs to make use of its resources there has emerged an unwillingness by States to impose arbitrary legal constraints on either public or private access and use, exploration, and exploitation.

Nonetheless, M. Smirnoff of Yugoslavia in his role as chairman of the Institute's working group on the Moon submitted a proposal in 1966 which included the

provision that celestial bodies "shall not be subject to national or private appropriation by claims of sovereignty, by means of use, or by any other means."[36] The proposal also indicated that non-governmental entities "may explore and use" celestial bodies with the permission of the parent State.[37] Thus, the critical distinction was made between the non-establishment of private property rights in the form of appropriation, e.g., exclusive use, and the private right to engage in non-exclusive uses in the process of exploration. But, this distinction was made regarding the celestial bodies, per se, and not with regard to their natural resources. In 1967, Article 2 of the Principles Treaty deleted the term "private" from its limitation on the means of effecting appropriation of outer space, the Moon, and celestial bodies. At this early stage groups of experts were suggesting that private property rights should not appertain solely to the indicated spatial areas.

Following the September 1963 withdrawal by the Soviet Union of its opposition to private space activity, Soviet participants in the Institute's meetings nonetheless sought to urge a restrictive meaning for Article 2 of the Principles Treaty. Thus, in 1968 G. P. Zhukov stated that this article "precludes any possibility of outer space, including the Moon and other celestial bodies, being appropriated by states, private persons or companies." [38] However, he forecast the need for States to engage in "coordinated efforts" regarding the "exploitation of minerals."[39] In the view of one observer the prohibition against national sovereignty respecting the Moon would result in a condition in which "nobody—whether a private person or a public body—can acquire the title to exploit its surface or its soil."[40]

E. Brooks, on the other hand, suggested that there was no need to determine if the prohibition against the presence of national sovereignty would inhibit exploitative activities on the Moon. In his view the "economic interests of States, private companies and individuals can be as well accommodated by an international organization as they can by the exercise of property rights on a national basis, violative of the non-appropriation clause" of Article 2 of the Principles Treaty.[41]

Zhukov in 1967, while unwilling to accept the position that private legal persons could engage in the exploitation of the natural resources of the Moon, observed that "Each state will have the right to use the natural resources of the Moon."[42] This outlook was favored in 1976 by Reijnen, who, however, has advanced the thought that States could only use such natural resources on the Moon. Support for this "exclusivity" proposal was based on the view that natural resources could not be appropriated under the terms of Article 2 of the Principles Treaty.[43] In searching for a legal doctrine upon which to rest this policy outlook Zhukov favored the acceptance of the analogy of "exploitation by a maritime state of the natural wealths on and under the surface of the continental shelf."[44] He rejected the analogy founded in the res communis principle of freedom of fishing on the high seas. He stated: "If a state proceeds to the mining of natural resources on a certain section of the Moon, and for that purpose erects there all the required installations and structures, it would be necessary to recognize the right of that state to the exceptional use of that section, like it has done with regard to the exceptional right of a maritime state to use the natural resources of the continental shelf."[45] In supporting the view that the continental shelf principle should apply to the development of natural resources at a given position on the Moon, he concluded that this would allow a State to "preserve the right to use exclusively this section. . . ."[46]

It was the view of Zhukov that since States would be able to serve their economic interests through the exclusive use and exploitation of the natural resources of areas of the Moon there was no need to extend the principle of national sovereignty, with its collateral right of national appropriation, to the natural resources, per se. With the adoption of Article 6 of the 1967 Principles Treaty allowing for non-governmental activities to take place in the space environment, exploitative activities were not limited to States. But, since the Principles Treaty was a statement of general principles, it was still necessary to determine whether the views of Zhukov that the exclusive national right to exploit natural resources should be considered to be a property right, and whether more explicit language than exists in Article 6 of the Principles Treaty, would be required to allow private firms to engage in the use and exploitation of the natural resources of the Moon. There was a further need to determine if Zhukov's proposal that a State could be economically dominant in a given section of the Moon could stand the test of the prohibitions contained in Article 2 of the Principles Treaty.

Writing in 1966 E. Fasan raised the question of whether there could be an appropriation by a State of a part of a celestial body when national appropriation of the entire body was prohibited.[47] He called for the need to draw a very clear line between the prohibition of sovereign appropriation of a celestial body and the right to use such a body. He noticed that natural resources, such as mineral deposits, on a celestial body would be exploited both by States and private persons. In his view

such natural resources "may belong to the individual or the nation that discovers or develops them."[48]

Following the completion of the Principles Treaty, and in the light of foregoing views, it became necessary to identify the relationship between Article 1 and other articles calling for the free exploration and use of the space environment and Article 2 denying national appropriation of the same environment.[49] At stake was a need to clarify if the prohibition against national appropriation of spatial areas also extended to the natural resources of such areas. Also at issue was whether the denial of national appropriation extended to a denial of property rights to private persons both regarding the spatial areas and to the natural resources located in such areas.

In examining these problems Brooks argued that prior to the Principles Treaty the res nullius principle applied to the natural resources of the space environment and that States, their nationals, and international organizations could have taken into "exclusive possession" such natural resources.[50] The free exploration and use provisions of Article 1 made it clear that the res communis principle was to have application to the Moon, celestial bodies, and outer space, per se. The meaning of Article 2 was also interpreted by Brooks. He began by referring to the view of Jenks, who had relied on General Assembly Resolution 1721 (XVI), that "What is forbidden is the national appropriation of outer space or celestial bodies; the legal regime applicable to any of their natural resources which it may prove possible to and profitable to exploit remains for consideration at a later stage in the light of fuller knowledge of what is practicable and probably."[51] Brooks was not overly persuaded by this interpretation. He suggested that the case was not so clear respecting the use and exploitation of planetary resources without claiming to appropriate them as was the prohibition against public sovereignty over spatial areas.[52] The debates in COPUOS relating to Articles 1 and 2 of the Principles Treaty indicated that some States considered that there could not be private property rights in the space environment and to natural resources located there.[53] On the other hand, other States considered that it was premature to arrive at a conclusion relating to the rights of States to establish valid claims to the natural resources of the space environment. Based on his assessment of the countervailing opinions Brooks concluded that "the question may still be open."[54]

The relationship between Article 1 and Article 2 of the Principles Treaty was described by Ambassador Goldberg as one in which the latter was seen as "complementing" the former.[55] The complementary relationship was identified by Brooks when he stated that "since the use of planetary resources is permitted but national appropriation is not, there is a point at which the use of a planetary resource becomes appropriation and is forbidden."[56] He reasoned that appropriation occurs when there is a substantial use of a tangible resource and when this results in "a significant benefit to a single nation."[57] Thus, while accepting the total prohibition placed on States, per se, in Article 2 relating to national appropriation of the space environment, per se, he accepted the proposition that a State could engage in exploitation provided the magnitude of the exploitation was not excessive. This would mean that a lesser account of exploitation of the natural resources of the areas was permissible when engaged in by a State. Although not stated, presumably private persons would be entitled at least to the same amount of exploitative use. Or, they might be allowed unlimited exploitative use of natural resources since Article 2 referred only to national appropriation and such prohibition on natural appropriation was limited only to the spatial areas—and not to the natural resources of such areas.

The suitability of the res communis principle to the use and exploitation of the natural resources of the Moon received much attention by space law experts prior to the COPUOS negotiations. Ferrer urged the application of this principle to the natural resources of the Moon in the form of "pieces of celestial bodies."[58] He regarded such resources as available for "utilization."[59] Szaloky considered that the res communis principle applied to areas and that they can be "freely used and exploited by anyone."[60] As to natural resources he stated that "by the act of separation they are endowed with a separate legal entity. In fact, following the separation they can be taken into ownership by occupation. Thus, any possible mineral resources, by developing them, may become subjects of property. They may be processed for transportation. They may be piled up for that purpose."[61] Salinas, in a more restrictive vein, accepted the res communis principle but would have applied it to the free use by astronauts of resources in situ.[62]

Opposition to the application of the res communis principle to the national appropriation of the natural resources of the Moon was expressed by S. M. Williams of Argentina. Going beyond the provision of Article 2 of the Principles Treaty that States should not be able to appropriate the Moon and celestial bodies, she rejected

the res communis principle when put forward either by States or by private legal persons respecting both the Moon and its natural resources. An exception to the foregoing would be allowed respecting natural resources returned to Earth for scientific purposes, which could not be "put into commerce."[63] Her support for the res communis humanitatus concept conditioned her willingness to accept the res communis principle. However, she held that such materials should be shared among States when brought to Earth exclusively for scientific purposes.

Prior to the submission by Argentina on July 3, 1970 of the proposal that the CHM principle should apply to the natural resources of the Moon and celestial bodies there had been particular support from Argentinian scholars, led by Professor A. A. Cocca, for the application of the res communis humanitatus concept only to the Moon and celestial bodies.[64] It was the view of Ferrer that the res communis humanitatus concept should be applied to the Moon and to celestial bodies because the acceptance of such an approach would assure their use for peaceful purposes and for the benefit of humanity.[65] Salinas also supported the res communis humanitatus concept and extended it to natural resources. In his view this concept would impose a duty on a State taking Moon rocks into possession to share them with other States for scientific purposes.[66]

Prior to the submission by Argentina of its Moon proposal to COPUOS in 1970 scholars were also debating the application of Article 2 of the Principles Treaty to the appropriation by States and by private legal persons of the natural resources of the Moon and other celestial bodies. Their observations centered on the explicit prohibition against the national appropriation of the spatial areas identified as the Moon and other celestial bodies. Thus, Ferrer in accepting the foregoing indicated that Article 2 did not ban "individual appropriation of portions separated" from the Moon and celestial bodies.[67] He noted that "The use of the common thing implies a kind of appropriation of its fragments, so long as, according to their nature, they are susceptible of such appropriation."[68] He also observed that the prohibition against national appropriation in the sense of claiming national sovereignty did not countermand the provisions in Article 6 of the Principles Treaty allowing national exploitative activities.[69]

Williams in 1969 made the point that national appropriation of the Moon and celestial bodies would violate Article 2 and supported the position advanced in 1968 by Brooks that large commercial uses of the Moon's resources would constitute national appropriation.[70] However, she acknowledged the right to engage in exploitation, provided it did not constitute appropriation.[71] She pointed to the post-1967 practices of the United States and of the Soviet Union. This was viewed as having formed a customary international law allowing only States to use "in any way they may wish—provided they do not obstruct other exploring nations—all products from celestial bodies as was the case befoe the treaty."[72] On the basis of her distinction between appropriation and exploitation, she indicated that even large-scale exploitation of renewable resources by States would not violate Article 2. While her preference was that such exploitation should serve scientific needs, nonetheless she considered that commercial exploitation—provided it not be so excessive as to constitute appropriation—was permissible. She supported this conclusion by expressing the belief that humanity would be the beneficiary. Moreover, the State producing such benefits was to be allowed to be compensated for the services rendered.[73] In short, in 1969 she argued against national appropriation of the Moon's natural resources, but favored the exploitation of such resources for both scientific and commercial purposes, provided that the commercial exploitation was generally limited. However, the exploitation of renewable natural resources could be unlimited.

Writing in 1970 Williams modified her views by indicating that the appropriation of all "space resources is fully banned" when carried out either by States or by private legal persons.[74] One exception was indicated, namely, that the "appropriation" of "non-exhaustible space resources was to be treated as permissible."[75]

In 1969 Fernandez-Brital supported the standard view that Article 2 of the 1967 Principles Treaty was a ban on national appropriation of spatial areas. He also drew a distinction between appropriation and exploitation and urged that exploitation for the sole purpose of scientific research was mandated by Article 1, paragraph 1 of the Treaty. In his view when natural resources were returned to Earth they should be turned over to an international agency for equitable distribution among States and for the benefit of humanity in general.[76]

Szaloky, as mentioned above, while referring to the exploitation of areas seemingly meant to include the natural resources of such areas.[77] His view that such exploitation was open to "anyone" must be read to include both private legal persons as well as States. He held that property rights might be possessed by those who had captured the natural resources of the Moon and celestial bodies.[78]

Rusconi in 1969 supported the application of the CHM principle to the natural resources of the Moon and other celestial bodies. Rather than constituting private property such resources, in this commentator's view, were to "belong to the whole of mankind and they are for their benefit and utility as their own property."[79] Such materials were to be a "part of a special regime of property for mankind, who will be able to use them."[80] It was foreseen by Rusconi that exploitation and use of such resources would be dependent on an international agreement providing for an international organization able to license the exploitation of such materials.

Following the promulgation by COPUOS in 1973 of a proposed Draft Treaty Relating to the Moon,[81] which contained the Soviet self-denying proposals relating to property and ownership rights to the surface or subsurface of the Moon, attention was drawn to the rights of private legal persons. This was viewed by Vassilevskaya as putting "an end to the unrealistic wishes of separate individuals to somehow acquire portions of the Moon."[82] In commenting on the 1973 draft Kopal did not go so far as Vassilevskaya in suggesting that private persons should be prevented from obtaining rights to the Moon or to its natural resources. It was his view that "such activities open new prospects for mankind as a whole."[83]

Writing in 1970 Curia added her support to the view advanced by other Argentinians in support of the res communis humanitatus concept. She considered the concept to be applicable to both the spatial areas of the Moon and celestial bodies and to their natural resources.[84] Support for the use of such natural resources on the Moon and celestial bodies by cosmonauts was considered to exist in Article 5 of the 1967 Principles Treaty. She also stated that it would be lawful for such resources to be returned to Earth for commercial purposes, since their earthy utilization would be for the benefit of mankind. Thus, the exploitation of such resources for both commercial and scientific purposes did not constitute a violation of the non-appropriation provision of Article 2 of the Principles Treaty.[85]

Support for the right of private legal persons to engage in commercial activities relating to natural resources came from Professor Diederiks-Verschoor in 1971. She visualized the presence of "industrial firms" owning stations situated on the Moon.[86] in order to formalize the right of States to allow private parties to have legal rights in natural resources and in the product of such resources manufactured by Moon laboratories she suggested the need for suitable international agreements.[87]

This review indicates that wide-ranging opinions were held by the early commentators as to the legal status of the Moon and celestial bodies and their natural resources particularly as relating to their appropriation and exploitation. Some considered that such natural resources could be lawfully exploited; others viewed such activity as an unlawful appropriation. Among those who favored the legality of exploitation of resources there were some who reserved this activity to States; others considered such activity to be lawful when pursued by both States and private legal persons. Some held the view that such exploitation should be restricted to scientific activity; others considered that the explitation might be directed to both scientific and commercial needs. In the minds of some the exploitative activity was sustainable under the res communis principle. Others preferred the res communis humanitatus approach, while at the same time taking account of the close theoretical affinity between such an approach and the emerging characteristics of the CHM principle. Other commentators rejected these legal principles and approaches and called for an analogy between exploitative activity on the continental shelf and the natural resources of the Moon and other celestial bodies. Several commentators considered that the United Nations should be given governmental and proprietary rights over such resources, while others expressed the view that there was a need to establish special international regimes to deal with such resources. These, and other, considerations were to confront COPUOS when it began to focus on official proposals for a treaty on the Moon and its natural resources in 1970.

In a larger context it is relevant to observe that international law does contain specific prohibitions against certain forms of conduct, but that in the absence of such prohibitions both States and other juridical and natural persons are entitled to engage in conduct without its being described as unlawful. Since Article 2 of the Principles Treaty did not prohibit the private use and exploitation of natural resources, and since one of the purposes of Article 1 was to allow for the sharing of benefits derived from the exploration and use of the space environment, it may be concluded that private persons were in effect ecouraged to engage in private space activities. Such conduct would fit into the expectations fortified by the res communis concept in its joint application to the conduct of States, international organizations, and private natural and juridical persons. The absence of any prohibition on the private use and exploitation of the natural resources of the Moon and other celestial bodies in the Principles Treaty must, therefore, allow such space activity to

take place, unless such activity is prohibited under other norms of international law. None appear to exist.

The terms of Article 2 of the Principles Treaty restrict only national appropriation of spatial areas. Thus, to the extent that States, pursuant to Articles 6 of that Treaty, authorize private legal persons to engage in exploitative activity regarding the natural resources of such spatial areas, such private activity would be permissible under both municipal laws and international law. If the drafters of the Principles Treaty had wished to bar the exploitation of the natural resources of the Moon and other celestial bodies by private legal persons, or if they had wished to prevent the acquiring of private property rights in such materials, they could have done so. The fact that such rights to exploit and to establish property rights in such natural resources were not specifically granted to private persons cannot serve to deny such claims when they are put forward. Nonetheless, in the search for legal security it is always preferable to have reliance on specific grants of authority. This fact influenced the governments holding membership in COPUOS to begin the preparation of an international agreement on this subject in 1970.

THE EMERGENCE OF CONCERNS FOR MANKIND

By 1970 there was increasing evidence that States must view their long-range political-legal options from the perspective of an existing world community. This concept of world relations can be questioned by those whose perceptions are of a world arena in which a considerably greater latitude is thought to exist for States as they engage in their search for national self-interest. Nonetheless, it is abundantly evident that in today's world the most powerful cannot proceed as they may wish without consulting the outlooks of other States. A too heavy reliance on certain national-interest policies may be counterproductive and regrettably myoptic in the presence of the need for all States to share in the effective management of world affairs. This includes the formation of world regimes, including one dealing with the Moon and its natural resources, designed to serve the needs, wants, interests, and values of mankind at large.

It was in this general context that Ambassador Lodge told the United Nations on September 2, 1958, that the goal of the United States was that "outer space will be used solely for the benefit of all mankind." In so doing he was reflecting President Eisenhower's policy statement in which he called upon States "to promote the peaceful use of space and to utilize the new knowledge obtainable from space science and technology for the benefit of mankind."[88] This outlook was quickly incorporated into early General Assembly Resolutions. Thus, Resolution 1348 of December 13, 1958, Resolution 1472 of December 12, 1959, and Resolution 1721 of December 20, 1961 proclaimed that the space environment was to be used in the "common interest of mankind" and for the "betterment of mankind."[89] Because of this background it was possible to provide in Article 1 of the 1967 Principles Treaty that "The exploration and use of outer space including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."[90] In testifying before the Senate Committee on Foreign Relations in connection with the meaning attributed by the negotiators to the term "province of all mankind" Ambassador Goldberg stated that the U.S. policy relating to the use of the space environment had been fixed in the 1958 National Aeronautics and Space Act, Section 102 (a). It provided that "activities in space should be devoted to peaceful purposes for the benefit of all mankind.'"[91] He further stated that "We did not believe that the language is any different 'for the benefit of mankind,' and 'the province of all mankind.' "[92] The negotiators reviewed with care the acceptance of the term "province," and, at the instance of the United States, it was accepted as being the equivalent of "benefit of all mankind."[93] The choice was influenced by a "discussion of various languages," and it was treated substantively as "a freedom-of-the-seas provision."[94] The freedom of the seas principle treats the resources of the seas as res communis, i.e., it allows for the general exploitation of such resources on an inclusive basis. This means that exclusive property rights may not be established relating to the spatial area and to the natural resources located therein. It is totally opposed to the concept of "patrimony" in the Latin American context of exclusive property rights.

In Ambassador Goldberg's view Article 2 of the Principles Treaty was complementary to the province of mankind provisions in Article 1. In his testimony he observed that Article 2 "is a statement that outer space is not subject to national appropriation by means of sovereignty, by means of use or occupation or by any other means, which means that outer space is the province of mankind."[95]

It is now well-established that Article 1 and other articles allow for the free exploration and use of the space environment, and that such space activities are to

serve the general benefits of all mankind. Lest the foregoing meaning of Article 1 be misconstrued the Committee on Foreign Relations attached an understanding respecting it which provided that "nothing in Article 1, Paragraph 1 of the Treaty diminishes or alters the right of the United States to determine how it shares the benefits and results of its space activities."[96]

The CHM principle, which has been influenced in its development by the "benefit of mankind," "province of all mankind," and res communis humanitatus concepts, received worldwide attention in 1967 when Ambassador Arvid Pardo, the representative of Malta to the United Nations, suggested its applicability to certain ocean areas. This proposal received very broad support with the adoption of General Assembly Resolution 2749 (XXV) on December 17, 1970 with 108 States, including the United States, voting for it, with none opposing, and 14 abstaining. Article 1 of that Declaration provided that "The sea-bed and ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction (hereinafter referred to as the area), as well as the resources of the area, are the common heritage of mankind." With the acceptance of the concept in the several negotiating texts produced by the Third UN Conference on the Law of the Sea from 1976 to the present the status of CHM has moved well beyond an abstract concept.[97] It now appears that it will beocme a firmly established principle of the international law of the sea.

With its acceptance in Articles 11 and 18 of the 1979 Moon Treaty the principle has applicability to the Moon and to its natural resources as particularly defined in that agreement. Article 1 prescribes that the treaty terms relating to the Moon "shall also apply to other celestial bodies within the solar system, other than the earth, except insofar as specific legal norms enter into force with respect to any of these celestial bodies."[98] Moreover, "reference to the Moon shall include orbits around or other trajectories to or around it."[99] Article 18 specifically refers to the CHM as a "principle."

THE UNDERLYING PREMISES OF THE CHM PRINCIPLE

As noted above, a legal principle is a starting point for legal reasoning. It is not the function of a principle to provide specific and detailed consequence-laden requirements. That is the function of rules, and these most frequently emerge as the principle is applied to practical situtations. Nonetheless, those who are asked to accept a principle having application to their needs, wants, interests, and values require some understanding and assurance as to the direction which may be taken by such principles. During the period while the Moon Treaty has been under negotiation agreement continued to build as to the meaning of CHM. All the elements of the concept, as it reached the status of a principle, have application to the exploration and use, including exploitation, of identifiable natural resources.

The CHM legal principle has its most immediate and prospective application in the area of the exploration and use, including exploitation, of natural resources. Intangible natural resources include the broadcast spectra, orbital positions, and scientific information. Tangible resources include moon rocks and other minerals and materials situated on the Moon or other celestial bodies within the solar system, other than the Earth.

The CHM principle has notable characteristics. First, it is an enlargement of the traditional international legal principle of res communis; thereby rejecting the res nullius perspective. As such it is just the opposite of the exclusive private property-public sovereignty principle respecting natural resources in their natural condition, e.g., prior to permissible capture, or use, and exploitation. Second, the principle seeks to benefit mankind generally by protecting the physical environment against unnecessary degradation. Third, it endeavors to conserve the world's resources for present and future generations.[100] Fourth, it seeks through agreement to achieve the goal of equitable allocation of such resources and benefits with particular attention to the needs of the less-developed countries. This is the essence of the res communis humanitatus concept. Fifth, it contemplates the presence or formation of an international regime containing such rules as may be necessary to insure the realization of the previously identified objectives. If it were to become apparent that a formal governing structure were required to provide for a normal and structured utilization of the spatial area and its resources, including, for example, processes for the resolution of disputes, it may be anticipated that the legal regime would lead to the establishment of a suitable international intergovernmental governing body.[101]

It must be borne in mind that the CHM principle is the product of a worldwide awareness of the fact that natural resources are being rapidly depleted. When the natural distribution of resources was made by nature not all States and peoples received an equal share of such resources. Thus, there are substantial political and economic forces at work in support of the distributive aspects of the CHM principle.

Realism must also take into account the fact that scientific and technological competencies are not equally shared among States, that military capabilities are very disparate, that there are wide ranges in the respective capacities of States to regulate their own affairs, and that the demands of some of the less-developed States for a larger sharing in the world's resources and benefits are abrasively strident.

Further, it has been perceived that all human beings are members of the human race no matter whether they live in the "North" or the "South," whether their loyalties are given to technologically advanced or disadvantaged States, and whether their ideologies support the cause of freedom or statism. Many of the advanced States, for example, have cooperated to ameliorate the pressing burdens of poverty in the LDCs, through what is known as development assistance. This has its foundations in moral concerns, since the history of mankind has been based on the proposition that the rich and powerful possess a moral obligation to aid those less favorably endowed. The sense of sharing has come to be considered as a precursor of a global fairness revolution. The CHM principle has been influenced by such considerations. It would be worse than blind to attempt to avoid the impact of such considerations as these when it comes to a meaningful appraisal of the CHM provisions of the Moon Treaty.

Article 11, paragraph 1, following acceptance that "The Moon and its natural resources are the common heritage of mankind," provides that "its expression" is to be found "in the provisions of this Agreement and in particular paragraph 5 of this article."[102] Paragraph 5 provides:

"5. States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible. This provision shall be implemented in accordance with article XVIII of this Agreement."[103]

Reference is made in Article 11, paragraph 7, to the main purposes of the international regime to be established to facilitate and govern the exploitation of the Moon's natural resources at such time as such exploitation is about to become feasible. Such main purposes, pursuant to paragraph 7, are:

(a) The orderly and safe development of the natural resources of the Moon;

(b) The rational management of those resources;

(c) The expansion of opportunities in the use of those resources;

(d) An equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon shall be given special consideration.[104]

These specifically identified criteria for the application of the CHM principle to the exploitation of the Moon's natural resources are wholly compatible with the CHM concepts that have been growing since the late 1950's. The specific focus given to the CHM principle in the Moon Treaty squares with the fact that neither States nor private persons can avoid the fact that all live in an increasingly interdependent world. The CHM principle, as a reflection of high principles of justice and equity, is a political-legal response to the world's unequal distribution of resources and human capabilities. It can facilitate the hope for a sharing of resource benefits. In its ultimate sense the CHM principle provides guidance in effecting an orderly and equitable distribution of benefits derived from Moon resources so that a measure of global fairness may be realized. The CHM principle does not impact upon preferences as to forms and means of economic organization and production. More specifically the CHM principle cannot reasonably be considered to be in opposition to the free-enterprise system of economic and political relationships. Both the free-enterprise and the socialist States will be able to live very comfortably with the CHM principle. This result is assured by the provision of Article 11, paragraph 7(d) which prescribes that as much special consideration is to be accorded to those countries "which have contributed either directly or indirectly to the exploration of the Moon" as is to be given to the developing countries.

Pursuant to the terms of the Moon Treaty States following the free-enterprise system will be beneficially served by the CHM principle. The principle will allow for the orderly exploitation of the natural resources of the Moon. This will allow all economic systems to have access to resources and to derive the benefits flowing from the existence of an understandable legal regime and prospective governmental structure. As is true with the general exploitation of resources the practical requirements imposed by the need for Moon resources will ensure the development of a legal regime based on the mutual self-interest of all concerned.

In order to understand the debate concerning the exploitability of the Moon and its natural resources it is necessary to understand the relevant differences between sovereignty, jurisdiction, and property. There is the further need to understand the relationship between public sovereignty and private ownership and use. A failure to make certain basic distinctions may produce confusion as to the utility of the CHM principle.[105]

In international law the principle of sovereignty in its most basic sense allows a State to exercise ultimate authority in a spatial area. Article 2 of the Principles Treaty denies the presence of national sovereignty in, or national appropriation of, the space environment consisting of outer space per se, the Moon, and other celestial bodies. Under international law the several principles of jurisdiction allow a State to exercise authority over persons and events located both within and outside of the areas in which a State possesses national sovereignty.[106]

In assessing the meaning of the 1979 Moon Treaty it must be remembered that the 1967 Principles Treaty placed heavy emphasis on freedom for the exploration and use of the space environment. In the years since 1967 the earlier interest in acquiring scientific data has been replaced by an era of practical applications in which the worth of space resources has been particularly identified and where there has been a resultant need to arrive at international agreements providing for the orderly exploitation of such resources. As expectations relating to exploitation were facilitated by scientific successes, the need for the development of legal controls became apparent. Such forces as these have impelled members of COPUOS to agree upon the terms of the Moon Treaty.

Considerations such as these induced Argentina on July 3, 1970 to submit to COPUOS a "Draft Agreement on the Principles Governing Activities in the Use of Natural Resources of the Moon and other Celestial Bodies." In Article 1 Argentina made the initial proposal for the application of the CHM principle only to the natural resources of the Moon and other celestial bodies, as opposed to the Moon and celestial bodies, per se. The Article stated: "The natural resources of the Moon and other celestial bodies shall be the common heritage of all mankind."[107] In Article 2 it was suggested that "All substances originating in the Moon or other celestial bodies shall be regarded as natural resources."[108] However, on March 30, 1973 Argentina submitted a revised and much enlarged proposal reading "The Moon and other celestial bodies and their natural resources shall be the common heritage of all mankind."[109]

In the meantime on May 21, 1971 the Soviet Union submitted to the UN a proposed "Treaty Concerning the Moon."[110] This proposal made no reference to the CHM concept. Further, it did not mention the terms of Article 2 of the 1967 Principles Treaty which prohibited national appropriation of the space environment. More specifically, the Soviet proposal did not reject the existing prohibition against public sovereignty in the space environment. The Soviet proposal, however, accepted the generally held view that the space environment was a res communis area. The Soviets focused their attention on the surface and subsoil of the Moon. As to this they sought to prevent the existence of property rights and ownership. They specifically proposed that private property rights could not be established on "the surface or subsoil of the Moon." Thus, Article 8 provided: (1) "Neither States, international intergovernmental or non-governmental organizations and national organizations having the status of juridical persons or not, nor natural persons, may claim the suface or subsoil of the Moon as their property. The emplacement of vehicles or equipment on the surface of the Moon or in the subsoil thereof, including the construction of installations integrally connected with the surface or subsoil of the Moon, shall not create a right of ownership over portions of the surface or subsoil of the Moon."[111] In keeping with their focus on the absence of private property rights relating to the surface or subsoil of the Moon the Soviet draft, in Article 8, paragraph 2, proposed that such areas could not become objects of legitimate transfer because of the non-existence of property rights. The Soviet proposal was limited to tangible surface or subsoil areas.

The Soviet proposal was explained by Zhukov in 1971. He stated that while States, international organizations, national organizations, and other legal persons could explore and use the Moon and its natural resources, such activity "does not create a right of ownership over the Moon, or over areas of the surface or its subsoil."[112] He indicated that the proposal was intended to elaborate and define further the terms of the Principles and Astronauts Treaties, including the prohibiting of military uses on the Moon, advancing the interests of peace, and serving the whole of mankind.

Upon analysis it is clear that the Soviet position was a self-denying one. By supporting the res communis principle, and by specifically urging that private

property or ownership rights might not be acquired in the surface or subsoil of the Moon, the Soviets were in fact accepting a part of a fundamental element of the more wide-ranging CHM principle identified above. Their 1971 proposed cannot be interpreted as being in total opposition to the CHM principle. The Soviet self-denying proposal did in not seek to prevent the gathering and use by space-resource States or their nationals of resources existing on the Moon and celestial bodies, which is allowable pursuant to the Principles Treaty.

Following the 1970 proposal of Argentina and that of the Soviet Union in 1971 the United States on April 13, 1972 submitted a working paper to the Working Group of COPUOS accepting the Argentinian CHM formulation in its original form, namely, that "the natural resources of the moon and other celestial bodies shall be the common heritage of all mankind."[113] This formulation was not consistent with General Assembly Resolution 2749(XXV) of December 17, 1970, which had been supported by the United States and by the Soviet Union. The latter applied the CHM principle to both the resources of the area and to the area consisting of the sea-bed and ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction. Further, the law of the sea resolution used the present tense "are" rather than "shall be."

The move for a more extensive application of the CHM concept to both the Moon and other celestial bodies and to their natural resources was initiated by Egypt and India on April 14, 1972.[114] On April 17, 1972 the United States submitted a new working paper in which it repeated its proposal of April 13 relating to the treatment of the natural resources of the Moon and other celestial bodies as CHM. However, it introduced a provision looking toward the reality of "the need for economic advancement and for the encouragement of investment and efficient development if there were to be a use of the resources of the Moon and celestial bodies."[115] Thus, the United States proposed a future conference at a time proximate to the practical utilization of such resources. The purpose of such a conference would be to negotiate an "arrangement for the international sharing of the benefits of such utilization."[116] This proposal was later to find acceptance in Articles 11, paragraph 5, and 18 of the Moon Treaty.

When the Working Group met in 1973 the Government of India suggested a reformulation of the unagreed to 1972 Article 10 on natural resources. Thus, India proposed a new paragraph 1 of Article 10 to read "The moon and other celestial bodies, their subsoil as well as their resources, are the common heritage of mankind."[117] On March 28, 1973 Iran urged a redrafting of a preambular part of the draft treaty so as to provide that the Moon, as a natural satellite of the Earth, "constitutes a common heritage of mankind."[118]

On March 28, 1973 the Soviet Union submitted a lengthy working paper in which the CHM principle was critically assessed.[119] The Working Paper asserted that the concept of "heritage" was merely a philosophical expression and could not be found in the substance of Soviet civil law. Moreover, it was argued that only those elements of civil law accepted by the USSR could become a part of international public law. Consequently, the CHM principle was rejected, since it had its source in the civil law concepts of "inheritance" and "succession." This dubious and highly mechanistic approach may be contrasted with the Soviet willingness to accept the "province of all mankind" principle. It was their view that the "province of all mankind" principle meant that "celestial bodies are available for the undivided and common use of all States on Earth, but are not jointly owned by them."[120] The "province of all mankind" principle was accepted without regard for its derivation in municipal law or otherwise. It was characterized from the Soviet perspective as a part of international public law, since it was set forth in the 1967 Principles Treaty.

The Working Paper also identified the Soviet view of "ownership," which was described as "the possession of a thing and the use of it."[121] The argument was made that since "ownership" or "property" were a matter of civil law it was possible to "confirm" their presence in international law by means of a "universal recognition of the corresponding parts of the civil law of States in respect of property rights over specific things."[122]

Thus, the Soviet Union indicated that it was willing merely to consider the application of the common province of all mankind "concept" in the proposed Moon Treaty. It rejected the CHM principle in 1973. This official position was mirrored in the subsequent writings of Soviet commentators, who as late as 1977 offered "fierce resistance" to the CHM principle.[123] Thus, writing in 1977 the Soviet commentator Dekanazov consistently urged that it would be erroneous to extend civil law concepts bearing on the meaning of CHM to interstate relations. He stated that "Under the circumstances it is ungrounded to speak of the common heritage of mankind as a principle of contemporary international law, and therefore, any mention of common heritage as a principle in the Treaty is, to my mind, unacceptа-

ble."[124] In his assessment Dekanozov considered the content of CHM to be the same for ocean space and the space environment. Dekanozov had previously urged that the CHM "conception is untenable from the legal point of view. It uses civil law categories in an arbitrary eclectic fashion without any regard for established legal realities and brings to mind undesirable associations . . ." like the res omnium communis "notion" which had been "transferred from the Roman private law into the field of international relations."[125] Thus, for the seabed and the subsoil thereof beyond national jurisdiction, for the ocean and its superjacent airspace, for Antarctica and its airspace, and for the Moon and other uninhabited celestial bodies, he stated a preference for the term "an international area (space) for common use."[126] His objection extended to the CHM Principle, to its application to both the spatial area of the Moon and to its natural resources, and to the linking of the CHM principle to both the Moon and to its natural resources in a single article of the Moon Treaty.[127] With the anticipated acceptance of the CHM principle in the Moon Treaty, instead of his plea for "an international area for common use," he urged that the CHM principle be "interpreted restrictively."[128] This would be consistent, in his view, with the prohibition contained in Article 2 of the Principles Treaty, and would allow for the exploitation of the natural resources of the Moon "in a manner compatible with the objectives of an international regime to be established."[129] Initial Soviet opposition to the CHM principle, which was considered to be closely "connected with the right of property, possession, and disposition of a thing,"[130] was based on an unwillingness to introduce concepts founded in civil law into international law. Further, there was an unwillingness to "justify the attempts to consider identical legal problems of the Moon with those of the sea bottom resources because in many cases they greatly differ and each of them require a different approach."[131] It was also considered that "the conception of 'common heritage' suggested by Latin American authors and taken by them from maritime law is a serious hindrance to the preparation of the Treaty on the Moon at present."[132]

In response to the March 28, 1973 Soviet position as to the meaning of the CHM Principle Argentina submitted a working paper on March 30, 1973.[133] It advanced the proposal previously favored by Egypt and India that "The Moon and other celestial bodies and their natural resources shall be the common heritage of all mankind." This replaced the more limited scope submitted in the Bulgarian working paper, which contained the text of a draft treaty consisting of a preamble and 21 articles, based on the text formulated by the Legal Sub-Committee during its pre-1973 sessions, together with certain changes and amendments. The earlier text would have merely prescribed that "The natural resources of the Moon and other celestial bodies shall be the common heritage of all mankind."[134]

On April 3, 1973 Italy submitted a 5-paragraph draft articles on natural resources which called for the establishment of an international regime "when such exploitation will become technically feasible." The formation of such a regime was to be "on the basis of the principle that the natural resources of the Moon are the common heritage of mankind."[135]

This was followed by a second working paper of Argentina dated April 17, 1973.[136] Argentina sought to reduce Soviet concerns that the term "heritage" was essentially philosophical in nature by pointing out that the Spanish equivalent was "patrimonio" and that had been used in modern international law to refer to the "patrimonial sea," namely, territorial waters. The Soviet position on the relationship between the CHM principle and that of "succession" was also addressed by Argentina. In its view, succession, as related to inheritance, was analytically consistent with the root of the concept of inheritance, e.g., heritage. Thus, according to Argentina, the whole substantive field of international law relating to State succession was available for guidance as to the meaning of heritage.

Argentina endeavored to clarify for the Soviets the relationship between succession and property. Thus, it was pointed out that there were at least two approaches to the concept of property, namely, ownership rights in property as represented in eminent domain and also the property aspect of the enjoyment, receipt of the fruits, and profits derivable through ownership. The Argentinian assessment identified this phase of property as falling within the domain of beneficial ownership. Further, according to Argentina:

"What is one to call this community of ownership, this conjunction of profits, this joint receipt of fruits and products—in a word, this common property of the moon? There is no need to create anything new. The idea of heritage—which can even be intangible—has existed since olden times, and it resolves the issue without major difficulty. Moreover, international law has always recognized, in addition to sovereignty, a right of ownership on the part of States, which is not different from the concept of ownership under general law."[137]

Argentina indicated that the CHM principle took into account the expectation that economic profits would be realized, that there would be an equitable sharing of such profits, that the needs of the LDCs would be taken into account in the sharing of profits, that this would necessitate the formation of a suitable international legal regime, and that this might lead to the creation of either international machinery or an international authority to give effect to such expectations. It was pointedly observed that the CHM Principle had been accepted as it applied to the ocean in General Assembly Resolution 2749 (XXV) without a dissenting vote. This was construed as "definite proof of the existence of this legal viewpoint common to all States, entirely irrespective of their special internal features, their philosophical ideas or their policies."[138]

On April 17, 1973 the United States submitted a very specific Working Paper concerning the right to the natural resources of the Moon and other celestial bodies. It gave support to the 1971 Soviet proposal insofar as it had provided that neither the surface or subsoil could be claimed as property. Thus, the United States suggested that:

"Neither the surface nor the subsurface of the Moon or other celestial bodies, nor any area thereof or natural resources *in place,* shall become the property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or any natural person."[139] (Italics added)

In commenting on the prospect for the utilization of lunar and planetary natural resources in the future, while taking into account the prohibition suggested by the United States in 1973, the General Counsel for NASA, Mr. S. N. Hosenball, stated that the United States did "not disagree with the basic principle that all nations should share in the benefits that would accrue when it becomes commercially feasible to obtain natural resources from the Moon or other celestial bodies."[140] At this time in the negotiations some States had urged that a moratorium should be placed on the exploration, use, and exploitation of such natural resources. This view—advanced by the LDCs—would have prevented exploitative activity until an agreement might be reached on the allocation of benefits to the LDCs. In indicating the opposition of the U.S. to such a moratorium he stated that its net effect would be "to destroy any incentive for the development of the technology, either for use experimentally or for its mass production."[141]

The 1973 U.S. proposal, by excluding property rights only of "natural resources in place," naturally would allow for the existence of property rights for such natural resources not in place or when removed from the original place. That such natural resources were not to be left forever in place was reflected in the Argentinian working paper of March 30, 1973, which stated that "The utilization and development *in situ* of the natural resources of the Moon and other celestial bodies, provided that they are undertaken in conformity with this Treaty, shall be lawful. * * *" [142] During the negotiations of the Moon Treaty many States supported the view that the Moon's natural resources in the form of rocks and minerals would be returned to Earth.[143] This right was assured in Article 6, paragraph 2 and in Article 11 of the Moon Treaty. Such Moon minerals have been characterized as constituting "both an economic, and, in addition, a scientific resource."[144] The United States also suggested the formation of an international regime to govern the exploitation of the natural resources of the Moon and other celestial bodies when "such exploitation becomes feasible."[145] Of great importance, the United States suggested that the proposals of other States denying the creation of ownership rights should be without prejudice to the proposed international regime. Further, such suggested prohibition of ownership were not to prejudice the "exploitation of the natural resources of the Moon or other celestial bodies pending the establishment of such a regime."[146]

In the 1973 COPUOS debates the United States indicated that its adoption of the CHM principle did not constitute either an express or implied prohibition on the use and exploitation of the natural resources of the Moon or other celestial bodies. The United States contemplated a future international conference at which time it would be agreed that suitable world processes would be identified for the distribution of CHM benefits. The pendency of the formation of such a regime was not to constitute a prohibition or a moratorium on the use of exploitation of natural resources.[147] However, it was clearly the position of the United States in 1973 that with the establishment of such a regime that its function would be to secure the implementation of the provisions of the CHM principle.

The United States went no further in its 1973 proposal than it had in 1972 relating to the scope of the CHM principle. In 1972 the United States with respect to natural resources stated that they "shall be" the CHM. In 1973 this was modified to "are" the CHM. In urging that only the natural resources of the Moon and other celestial bodies should fall within the principle, the United States also suggested

that the CHM principle should not be employed in such a way as to inhibit the freedom of scientific investigation, including the right of a State to collect on and remove from the Moon samples of its minerals and other substances.[148]

The U.S. proposal accepted the 1971 Soviet draft whereby juridical and natural persons were not to be allowed to have property or ownership rights respecting the surface or subsoil of the Moon and celestial bodies. Both States were also committed through the 1967 Principles Treaty not to appropriate by means of sovereignty or otherwise the Moon and celestial bodies. Consequently, both were in agreement that public sovereignty rights were not applicable to the space environment and that private property rights could not be established respecting the surface or subsurface of the Moon, not any part thereof nor natural resources in place.[149]

By 1976 additional support for the CHM principle had emerged within COPUOS. Thus, Italy had proposed that "The economic resources of the Moon, due to be (when) transferred on to the Earth, shall be dealt with as common heritage of mankind; all States shall have an equal and unhindered access to them on a equitable basis."[150] At the same time Italy offered the view that Moon resources when transferred to the Earth could not appertain to "any country for its own exclusive economic profit." While the members of COPUOS welcomed this support for the CHM principle, it is notable that the Italian submission that would have prevented a State from being entitled to "exclusive economic profit" was never accepted and forms no part of the Treaty.

In 1976 COPUOS also received a joint Working Paper from Argentina, Brazil, Chile, Indonesia, Mexico, Nigeria, Romania, Sierra Leone, and Venezuela. They urged that "States Parties undertake to establish an international regime governing such exploitation on the basis of the principle that the Moon and its resources are a common heritage of mankind."[152]

By the close of 1977 the Working Group had arrived at a text based on informal consultations. They were in agreement that it would be necessary to establish an international regime governing the exploitation of the natural resources of the Moon when such exploitation were to become feasible. This agreement, which was to become Article 11, paragraph 5, of the Moon Treaty, plainly indicated that an international regime was to be established when exploitation were proven feasible. It did not state that the regime would have to be established prior to exploitation. Consequently, and consistent with the expectations developed during the negotiations, exploitation may take place now. Further, the working group were in agreement that the future regime was to be organized "on the basis of the principle that the natural resources of the Moon are the common heritage of mankind."[153]

On the basis of the deliberations of the Working Group, and pending the appearance of the 21 article Austrian Working Paper on April 3, 1978[154] relevant questions were being raised relating to the existing work product of the negotiations. Among these were: What is the legal meaning to the accorded to CHM? Is it a concept or is it a principle? Does it apply to both exploration and to exploitation of the Moon's natural resources? And, "What activities would be permitted with regard to the Moon's resources before an agreed international regime governing exploitation of those resources is established and in force?"[155] According to Chen "certain members considered 'common heritage of mankind' as a philosophical concept lacking legal content which had no place in a legal instrument, while others maintained that it was a legal concept and a prerequisite for the elaboration of a treaty relating to the Moon. Some members held the view that activities should be permitted only for scientific purposes and that no commercial exploitation of the natural resources should take place before the establishment of the international regime; others thought that utilization of the Moon and its natural resources should also be allowed for other experimental purposes; still others were of the opinion that utilization should be allowed for any peaceful purpose pending the establishment of the international regime."[156]

In this scenario there were three capital forces at work. There were national and private wishes to obtain tangible Moon resources without upsetting the provisions of the Principles Treaty. There was the wish by an increasing number of States that the Moon and celestial bodies might be treated as CHM resources, and this was later amended to include the natural resources of these areas as being CHM resources. There was also the wish that express agreement might be reached that natural and juridical persons could not claim the surface or subsoil of the Moon as their property.[157] The reconciliation of these competing outlooks reached fruition in Articles 6, 11, and 18 of the 1979 Moon Treaty.

ARTICLE 6 OF THE MOON TREATY

There was initial support for the right of States, while engaging in scientific investigations, to collect Moon rocks. Article 6, paragraph 2 of the Treaty has used

exemplary language authorizing such activities, namely: "In carrying out scientific investigations and in furtherance of the provisions of this Agreement the States Parties shall have the right to collect on and remove from the moon samples of its mineral and other substances. Such samples shall remain at the disposal of those States Parties which caused them to be collected and may be used by them for scientific purposes. States Parties shall have regard to the desirability of making a portion of such samples available to other interested States Parties and the international scientific community for scientific investigation. States Parties may in the course of scientific investigations also use mineral and other substances of the moon in quantities appropriate for the support of their missions."[158] Without the use of such words as "property" and "ownership" the Article did not interpose inhibitions upon the exclusive use by the space-resource States of the identified substances. At the same time such States, as a result of such scientific activity, were not granted a status whereby they might assert sovereignty over the Moon and celestial bodies. Space-resource States were given specific power to use the identified materials in quantities needed to engage in the present and immediate need of carrying on scientific investigations. Since, over time, the nature and extent of such investigations may be far-ranging, this provision will allow for very substantial uses of natural resources.

The fact that Article 6, as well as all of the other Articles of the Treaty, contains the term "States Parties," except for Article 1 which is definitional, does not mean that only States may engage in the exploration and use, including the exploitation of the substances and natural resources of the Moon. Article 14 makes it clear that States can act through both "governmental agencies" and "non-governmental entities." Both governmental and private endeavors are considered to be national activities. Article 14 is consistent with Article 6 of the 1967 Principles Treaty. Illustrative of the "States Parties," provisions of the Treaty is Article 8 which provides that such parties "may pursue their activities in the exploration and use of the Moon anywhere on or below its surface, subject to the provisions of this Agreement."

ARTICLE 11 OF THE MOON TREATY

Article 11 with its focus on the establishment of the CHM principle for both the Moon, including other celestial bodies in the solar system, and its natural resources was the most difficult to negotiate and contains the most important provisions in the agreement. This Article has been accepted by the Soviet Union despite its initial non-support. The Article also adopts the 1971 Soviet proposal denying to juridical or natural persons property or ownership rights in the surface and subsurface of the Moon nor any part thereof or "natural resources in place." The denial of the specified property and ownership rights, namely, exclusive rights, set out in paragraph 3 of Article 11 were, by the terms of the same paragraph, entered into "without prejudice to the international regime referred to in paragraph 5 of this article."

Pursuant to paragraph 5 the parties undertake to establish that regime "including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible." The Treaty allows for exploitation of natural resources. In addition to the foregoing provision the Preamble of the Treaty calls attention to the need to bear in mind "the benefits which may be derived from the exploitation of the natural resources of the Moon and other celestial bodies." In response to a suggestion that Article 7, dealing with environmental matters, might be modified as it related to the CHM principle, COPUOS provided an interpretation, as follows: "Article VII is not intended to result in prohibiting the exploitation of natural resources which may be found on celestial bodies other than the earth, but, rather, that such exploitation will be carried out in such a manner as to minimize any disruption or adverse effects to the existing balance of the environment."[159] This construction of COPUOS is consistent with the interpretation provided by Mr. S. N. Hosenball, who served as head of the U.S. delegation to COPUOS in 1979. He stated to COPUOS on July 3, 1979 that it was the understanding of that body that the language of Article 7 was " not intended to be read in such a way as to result in prohibiting exploitation of natural resources to be found on celestial bodies, but, rather, that any such exploitation is to be carried out in such a manner as to minimize, so far as possible, disruption of or adverse changes in the enviornment."[160] Although this statement was made in the context of the theme that the CHM principle seeks to prevent the unnecessary degradation of the physical environment, as reflected in Article 7 of the Moon Treaty, it also emphasized the prospect of the lawful exploitation of the natural resources of the Moon and other celestial bodies.

Mr. Hosenball told COPUOS that Article 11 made it clear the parties to the agreement "undertake, as the exploitation of the natural resources of the celestial

bodies other than the Earth is about to become feasible, to convene a conference to negotiate an international regime to govern the exploitation of those mineral and other substantive resources which may be found on the surface or subsurface of a celestial body."[161] He further stated that the terms of the agreement, which had resulted from many compromises on the part of COPUOS members, "places no moratorium upon the exploitation of the natural resources on celestial bodies, pending the establishment of an international regime."[162] By not imposing a moratorium on the exploitation capabilities of the space-resource States it will be possible for them to embark immediately on experimental activities to be followed by pilot operations as the realities of the situation may dictate. If during such exploitative operations it were ascertained that practical gains would be realized, and if there were a future interest in the formation of the identified regime, he assured the members of COPUOS that the United States would "make every effort to see that the regime is successfully negotiated."[163] He also called attention to the fact that activities respecting the natural resources of the Moon were to conform both the Article 11, paragraph 7 dealing with the implementation of the CHM principle, and Article 6, paragraph 2, dealing with the use of Moon substances for scientific purposes. He drew the conclusion that these provisions made it clear that "the right to collect samples of natural resources is not infringed upon and that there is no limit upon the right of States parties to utilize, in the course of scientific investigations, such quantities of those natural resources found on celestial bodies as are appropriate for the support of their missions. We believe that this, in combination with the experimental and pilot programs, will foster and further, and perhaps speed up, the possibility of the commercial or practical exploitation of natural resources."[164] Just as an infant creeps before it crawls, and crawls before it walks which is its form of exploiting the surface on which it is engaged in these respective forms of movement, so also a State or its nationals will be exploiting the natural resources of the Moon in the course of their experimental activity, pilot plant operations, and full-scale operational and use activities. Thus, the central strategy behind these provisions was to allow for exploitative activity despite an awareness of the fact that there would be extraordinary costs involved in returning substantial amounts of such resources to Earth.

The United States was also interested in indentifying the relationship between the 1967 Principles Treaty and the Moon Treaty. The Principles Treaty assures the free use of the space environment and access to it subject to basic limitations. The Moon Treaty makes provision for the exploitation of the Moon's natural resources as well as exploration and use after they have been taken into possession. Thus, the Moon Treaty, in keeping with the general tenor of the Principles Treaty, assures uses subject to conditions. In this context Mr. Hosenball stated:

"In regard to the matter of the Moon treaty's relation to the 1967 Outer Space Treaty, discussions in the Committee resulted in no statements to the effect that the Moon treaty is intended to weaken in any way the provisions of the 1967 Treaty. In this light, and taking into account the last two preambular paragraphs of the Moon treaty, there was a feeling that a non-derogation provision would be superfluous. Our delegation accepted this view, and has joined in the consensus on the Moon treaty with the understanding that it in no way derogates from or limits the provisions of the 1967 Outer Space Treaty."[165]

Following Mr. Hosenball's statement the Soviet representative at COPUOS, Mr. Kolossov, stated that his government had been optimistic concerning the achievement of consensus on the draft Moon Treaty. While he observed that the Soviet Union would "make no hasty interpretation of the meaning behind each article of the new draft agreement,"[166] he did not raise any objection to the interpretations previously made by the U.S. representative.

In a prepared statement before the House Subcommittee on Space Science and Applications on September 6, 1979, Mr. Hosenball provided additional information relating to the manner in which the Moon Treaty had achieved consensus in COPUOS.[167] He stated that the exact formulation of the CHM principle as it related to the exploitation of natural resources had caused the greatest difficulty to the negotiators. At the end of the Legal Sub-Committees negotiations in April 1978, the relevant draft of Article 11 provided:

"1. For the purposes of this Agreement, the Moon and its natural resources shall be considered the common heritage of mankind, which finds its expression in the relevant provisions of this Agreement and in particular in paragraph 5 of this article."[168]

During the 1979 meeting of the Legal Sub-Committee the government of Brazil suggested that the foregoing might read:

"1. The Moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this [Agreement] [Treaty] and in particular in paragraph 5 of this article."[169]

Consensus was obtained in COPUOS on the Brazilian formulation of Article 11. Mr. Hosenball advised the House Subcommittee that this resulted from acceptance by the Soviet Union and by the agreement on the part of the developing countries "not to insist on a provision imposing a moratorium on the exploitation of natural resources pending the establishment of an international regime to govern such exploitation."[170]

In his testimony he took some pains to point out that although the CHM principle had been established in Article 11, paragraph 1, that it was tied to the establishment of a future international regime, and that a process for dealing with such negotiations appeared in Article 18 of the Treaty. He also developed at some length the open and public commitment of the United States during the early 1970's to the proposition that the natural resources of the Moon and celestial bodies should be governed by the CHM principle.[171]

This documentation clearly identified the negotiating strategy of the United States in which it had sought to preserve the guarantees contained in the 1967 Principles Treaty relating to free exploration, use, and access to the space environment. During the 1972 and 1973 outer space negotiations the issue of the imposition of a moratorium on outer space use and exploitation had been raised. This position had been advanced by the group of developing nations that had introduced the same proposal for a moratorium respecting deep seabed resources before the General Assembly of the United Nations and which had secured the adoption of General Assembly Resolution 2750C (XXV) on December 17, 1970 by a vote of 108 in favor, 7 against, and 11 abstentions. The United States opposed a moratorium respecting exploration and use of both space and ocean resources. As to the former, Mr. Hosenball reminded the members of the Subcommittee, that in 1973 COPUOS had been advised that:

"The United States is not prepared to accept an express or implied prohibition on the exploitation of possible natural resources before the international conference meets and agrees on appropriate machinery and procedures and a treaty containing them takes effect. In our view, the Moon agreement cannot reasonably seek to require that exploitation must await the establishment of the treaty-based regime."[172]

He also referred to the U.S. working paper presented to COPUOS on April 17, 1973,[173] in which it had been indicated that the concept of a pre-regime moratorium had been excluded. The U.S. had stated in 1973 that:

"As is apparent from the text, this working paper excludes the concept of a pre-regime moratorium. References to the words "in place" in the first sentence of that paragraph [2] and to paragraph 7 of Article X make this clear. More particularly, the words "in place" in the first sentence of paragraph 2 are intended to indicate that the prohibition against assertion or property rights would not apply to natural resources once reduced to possession through exploitation either in the pre-regime period or, subject to the rules and procedures that a regime would constitute, following the establishment of the regime."[174]

Mr. Hosenball told the Subcommittee in 1979 that the above statements "were not contradicted and constituted a part of the legislative history of the treaty negotiations."[175] The legislative history of the drafting of an international agreement will, of necessity, provide the foundation upon which the interpretive process rests. When the terms of the Moon Treaty are connected with statements constituting the legislative history, it should be clear that the Treaty seeks to assure that exploratory and exploitative activities will be encouraged. The transition from experimental to pilot programs, and from pilot programs to commercial activity can be forecast. This activity is permissible to determine the feasibility of further exploitation. Once this has been demonstrated, the proposed regime can be negotiated. From the point of view of the free-enterprise system the Moon agreement will allow for the planned, orderly and legally controlled space activities. Thus, the Treaty is clearly consistent with the 1967 Principles Treaty. The Soviet-proposed restrictions against property or ownership rights on the surface or subsurface of the Moon are conditioned by the U.S. sponsored "in place" requirement. This forestalls a limitation on a free-enterprise system. It was the purpose of the United States in amending the Soviet proposal by adding the term "in place" to make sure that the prohibition against the assertion of property rights would not apply to Moon rocks and other natural resources when they were reduced to the possession of the exploiter. At that time the exploiter would be using something that had been acquired, and it would not constitute either a property right or an ownership right in the surface or subsurface of the Moon. Once materials on the surface or derived from the subsur-

66-705 O - 80 - 14

face had been taken into possession or acquired they are no longer "in place." No advantage would be derived by the acquirer or possesser if the materials were to be left in place. Only by their movement and their subsequent utilization could they have value to the acquirer. As pointed out above there is a real and important distinction between the right to acquire and use a movable resource and fixed property or ownership rights—enabling an owner to exclude all others from an identifiable spatial area. The gathering of a Moon rock or of lunar substances for use is the substantial equivalent of the harvesting of a living resource in the ocean. The Moon Treaty preserved this distinction by denying property or ownership rights to the natural resources of the Moon or celestial bodies only so long as such resources remain in place. The Treaty, furthermore, is internally consistent on this point. Article 11, paragraph 8, by referring to Article 6, paragraph 2, has used words making it clear that there is a right to collect mineral samples in connection with scientific investigations and that such substances and other natural resources may be used by the collector for scientific purposes. This position was reflected by Mr. Hosenball in his July 1979 statement to COPUOS.[176] The other members of COPUOS did not disavow this interpretation. He also brought this aspect of negotiations to the attention of the House Subcommittee.[177]

In his appearance before the House Subcommittee Mr. Hosenball also recounted the negotiating history as it related to the spatial application of the CHM principle. He noted that in the 1979 COPUOS Report it would be pointed out that the Committee was in agreement that "by virtue of Article I, paragraph 1, the principle contained in Article XI, paragraph 1, would also apply to celestial bodies in the solar system other than the Earth and its natural resources."[178] Article 1, paragraph 1 reads: "The provisions of this Agreement relating to the Moon shall also apply to other celestial bodies within the solar system, other than the Earth, except insofar as specific legal norms enter into force with respect to any of these celestial bodies." Mr. Hosenball stated that "the plain meaning of this Committee agreement is to limit application of the 'common heritage' principle to the celestial bodies themselves and to the natural resources of such celestial bodies."[179] Continuing with his assessment of the spatial application of the CHM principle, he stated in his next sentence that "Clearly, there is no intent to apply the principle to orbits and trajectories of space objects."[180] This observation must be examined from the perspective of the language of paragraph 2 of Article 1 which states that "For the purpose of this Agreement reference to the Moon shall include orbits around or other trajectories to or around it." This means that the CHM principle applies to Moon orbits and trajectories. This follows from the language of Article 11 applying the CHM principle to the Moon and to its natural resources and the language of Article 1, paragraph 2, pursuant to which the Moon is defined to include orbits around or other trajectories to or around it. Thus, Mr. Hosenball's observation identifying the spatial non-applicability of the CHM principle means only that the DHM principle does not apply to orbits around the Earth.

The need for clarification as to the spatial coverage of the CHM principle was acknowledged by Mr. Hosenball when he made a statement for the record on July 3, 1979 at COPUOS. He identified the U.S. understanding of the Article's meaning as follows:

"We accept the Committee's conclusion as to this Article—namely, first, that references to the Moon are intended to be references also to other celestial bodies, other than the Earth; secondly, that references to the Moon's natural resources are intended to comprehend those natural resources to be found on these celestial bodies; and thirdly, that the trajectories and orbits referred to in Article I, paragraph 2 do not include trajectories and orbits of space objects in Earth orbit only, or trajectories of space objects between the Earth and Earth orbit.

"In regard to the phase "Earth orbit only," the fact that a space object in Earth orbit also is in orbit around the Sun does not bring the space objects which are only in Earth orbit within the scope of this treaty; and a space object orbiting the Moon, while the Moon orbits the Earth as well as the Sun, is in fact within the scope of this treaty."[181]

This interpretation was received with approval by COPUOS. Thus, the 1979 COPUOS report has recorded that the Committee was in agreement that "the trajectories and orbits mentioned in Article I, paragraph 2, do not include trajectories and orbits of space objects in Earth orbits only and trajectories of space objects between the Earth and such orbits."[182] In short, the acceptance of the CHM principle in the proposed Moon Treaty does not deal with Earth orbits and trajectories only. Thus, the Moon Treaty will not have any application to the process of ascending into Earth orbit or remaining in such an orbit. Since this use of the space environment has been and will continue to be the space activity having the greatest political, economic, and military value it is hard to see, either at the present or even

in the future, how the proposed treaty will present any threat to the free-enterprise system in these exploitable areas.

As has been pointed out the CHM principle encompasses the concept of the sharing of benefits produced by the space-resource States with those States still in the process of development. Since the advanced States have risked their resources in hazardous, space activities, there has been a natural wish on their, and for their nationals, part to recoup their investments and to obtain profits as well as to be of assistance to States still in a developmental condition. Thus, a discussion of the distribution of benefits will be an ongoing one, with many new proposals still to be heard as to sharing. In his review of the Moon Treaty negotiations Mr. Hosenball pointed out that there was "nothing in the text [that] suggests that all countries are to share equally in the Moon's resources."[183] He also stated:

"Any sharing of resources would have to be agreed to in an international conference. Article XI, paragraph 7, uses the phrase "equitable," not "equal" sharing. In determining "equitable" sharing, special consideration is to be given not only to the needs and interests of the developing countries but also to 'the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon.'"[184]

This language, which is an accurate paraphrase of Article 11, paragraph 7(d), is consistent with other international formulas seeking to effect a distribution of natural resources. For example, Article 33, paragraph 2, of the 1973 International Telecommunication Convention provides that radio frequencies and the geostationary satellite orbit must be so used as to enable countries or groups of countries to "have equitable access to both . . . according to their needs and the technical facilities at their disposal."[185] This formula has allowed for a satisfactory forum for the negotiation of competing claims. It may be expected that paragraph 7(d) will allow for a suitable blending of the respective claims of States for an equitable share of CHM resources.

Consistent with and supporting the foregoing analysis was the statement of Ambassador R. W. Petree to the General Assembly's Special Political Committee on November 1, 1979. (Press Release, USUN-107 (79), 1 November 1979.) He reemphasized the fact that consensus diplomacy had produced an agreement that enhanced the opportunities of States and defined juridical and natural persons to engage in space activities, including the exploration, use and exploitation of the Moon and its natural resources. He stated that the Moon Treaty was consistent with the 1967 Principles Treaty, that the former did not derogate from the latter, that the Moon Treaty did not provide for a moratorium on exploitative activities, and that there was a compatibility between the provisions allowing for scientific and commercial activity respecting the Moon and its natural resources.

Following specific reference to Article 6, paragraph 2, dealing with the right to collect and remove mineral substances for scientific purposes, and to Article 11, paragraph 7, identifying CHM objectives, as "providing both a framework and an incentive for exploitation of natural resources of celestial bodies," (Ibid., p. 7.) he stated that:

"They constitute a framework because even exploitation which is undertaken by a State Party to the Treaty, or its nationals outside of the context of any such regime, either because the exploitation occurs before a regime is negotiated or because a particular State may not participate in the international regime once it is established, will have to be compatible with those purposes set forth in Article 11, paragraph 7 of the Moon Treaty.

"The same paragraph also is an incentive. By setting forth now the purposes governing exploitation of natural resources, uncertainty is decreased and both States and private entities may now find it possible to engage in the arduous and expensive efforts necessary if exploitation of the natural resources of the celestial bodies is ever to become a reality." (Ibid.)

Following other equally informed expressions by representatives of other States the Special Political Committee submitted the Moon Treaty to the General Assembly for its approval. When the matter came before the General Assembly on December 5, 1979 the Moon Treaty was approved without a formal vote. (U.N. Doc. A/34/PV.89, 10 December 1979.) The Moon Treaty was thereupon referred by the Secretary-General of the United Nations to the member States for signature and for ratification in accordance with their constitutional requirements. As they engage in their respective deliberations they will give special consideration to fact that the agreement allows for the exploitation of the Moon and its natural resources.

THE CAMPAIGN AGAINST AN EFFECTIVE LEGAL REGIME IN THE SPACE ENVIRONMENT

In the short time since COPUOS gave its approval to the Moon Treaty several U.S. commentators, who have played a role in the identification of policy as it may

relate to the use and exploitation of ocean resources, have evidenced their concern as to certain Treaty terms by asserting that the CHM principle violates the concept of free enterprise. It had been quite evident among the members of COPUOS that at the same time that they had been determining the applicability of the CHM principle to the Moon and to its natural resources that the delegates to the Third United Nations Conference on the Law of the Sea were analyzing the same concepts. For example, the Australian representative during the 1979 debates on the Moon Treaty stated that "Some delegations have informally indicated the special difficulty which arises from the fact that the notion of the common heritage of mankind is also at the center of the Law of the Sea negotiations."[186]

It is true that the Group of 77 circulated a text on August 16, 1974, at the Law of the Sea negotiations, which read: "The area and its resources being the common heritage of mankind, the title to the area and its resources and all other rights in the resources are vested in the Authority on behalf of mankind as a whole. These resources are not subject to alienation." However, by 1976 the Law of the Sea negotiators had rejected this proposal and had not ordained that such resources were to be "vested" in the proposed Authority. Further, all of the Law of the Sea texts from 1975 down to the present have provided that "The Area and its resources are the common heritage of mankind."[187]

Resistance to the formation of an orderly legal regime for the exploitation and use of the Moon and its natural resources has rejuvenated the same objections that have been made regarding the establishment of an orderly legal process for the exploitation and use of the manganese nodules lying on the deep seabed and ocean floor. In each instance it has been suggested that the acceptance of the CHM principle would in some manner deny to the scientifically and technologically advanced States and their nationals the prospect of successful exploitation and use.

It has been evident that the critics of the CHM principle possess preferred policy outlooks. In general terms they are opposed to regulation of almost any kind, and particularly a regulatory process that is international in character.[188] While, in principle, they are not friendly to national controls, these would be acceptable in preference to other forms of governance, and particularly if national control could be blended with a considerable amount of national protections and benefits. It is possible that by launching an attack on the CHM principle as identified in the Moon Treaty an effort has been made to seek to discredit the CHM principle as it may ultimately be contained in a Law of the Sea international agreement.

The early attacks on the Moon Treaty in the United States raise four issues. There has been an effort to demonstrate that the language of the Treaty, and the purposes attempted to be achieved by such language, had been misinterpreted by the principal U.S. negotiator in his statements to COPUOS and to the House Subcommittee on Space Science and Applications on September 6, 1979. In particular, it has been alleged that the United States has agreed to a moratorium on the exploitation of the natural resources of the Moon.[189] It has also been asserted that Mr. Hosenball's comment on the meaning of the "in place" provision of Article 11, paragraph 3, cannot be supported.

Second, there has been an effort to demonstrate that a consistent position exists between the Soviet Union and the less-developed countries, and that they somehow can find support in the Moon Treaty to prevent the United States or its authorized nationals from engaging in the exploitation of the indicated natural resources. Third, there has been an attempt to use the language of the proposed treaty to demonstrate that supporters of the free-enterprise system will not embark on the required investments either because of the prospect that there will be an international legal regime at some future date or because of the absence of such a regime at the present time. Finally, by failing to examine analytically the nature and purpose of the negotiations there has been an unfortunate tendency to grasp at the presumable literal meaning of words without taking into account the gloss applied to them during the extended diplomacy of consensus.

The allegation that the principal U.S. negotiator has misinterpreted the meaning of the Treaty as it relates to a moratorium on the exploitation of the Moon's natural resources is particularly unfortunate. As stated above the United States has consistently opposed the thought that there should be a moratorium on the exploitation of both Moon and deep seabed resources. To be inconsistent on this issue would weaken the total policy position of the United States. The purpose and intent of the Moon Treaty, as well as its language in Article 11 and in Article 18, is to allow for the present exploitation of Moon resources. It is only the establishment of the international regime that is to await exploitation—which exploitation in a physical sense would be expected to be more limited at the beginning than later. The regime is to follow the exploitation—not the exploitation to follow the regime. Since there is no specific provision in the Treaty providing for a moratorium, since some States

at one time endeavored to introduce the language of moratorium into the negotiations, since their efforts were rebuffed, since the chief U.S. negotiator has categorically indicated that no moratorium existed, and in view of the fact that this statement was not denied in COPUOS, it would appear that the only way that those who wish to read a moratorium into the agreement can do so is by way of implication. While it is not unusual to receive arguments premised on inference, this approach does not have merit in this situation for the foregoing reasons. Additionally, it would be inconsistent to identify the "exploitation of the natural resources of the Moon and other celestial bodies" as a purpose of the Treaty as set out in the Treaty Preamble, and then attempt to establish only on the basis of inference the presence of a major limitation on the desired result. Further, the environmental protections contained in Article 7 were understood by COPUOS, according to the uncontroverted statement of Mr. Hosenball, to mean that this Article was "not intended to be read in such a way as to result in prohibiting the exploitation of natural resources to be found on celestial bodies but, rather, that any such exploitation is to be carried out in such a manner as to minimize, so far as possible, disruptive of or adverse changes in the environment."[190] This language contemplates a present exploitation, and this is hardly in keeping with a moratorium.

Some confusion seemingly has arisen in the minds of critics of the provision in Article 11, paragraph 3 that "Neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall become property. . . ." Members of COPUOS in agreeing to the foregoing language sought to eliminate the original Soviet proposal of 1971 whereby the Soviet Union endeavored to prevent juridical and natural persons from claiming "the surface or subsoil of the Moon as their property."[191] This would have been a total prohibition against property rights and ownership. When the United States urged the inclusion of the words "in place" the U.S. representative stated that these words were intended "to indicate that the prohibition against ascertation of property rights would not apply to natural resources once reduced to possession through exploitation either in the pre-regime period, or, subject to the rules and procedures that a regime would constitute, following the establishment of the regime."[192] The terms of Article 11, paragraph 3 are clearly intended to allow for exploitation upon the taking of possession of such items. This is not the language of moratorium.

A second attack has been made on the meaning of the Treaty as reflected in its negotiation and as explained both by COPUOS in its formally drafted commentary on the Treaty[193] and by the essentially identical language of the principal U.S. negotiator. It has been made to appear by some commentators that the terms of the Treaty and the indicated COPUOS and U.S. interpretations are still subject to the willingness of the Soviet Union and the less-developed countries to accept the foregoing views.[194] In principle it is difficult to understand how such Soviet and Third World views, even if contrary to those just identified, would negate such interpretations and thereby deny to the United States and its authorized nationals the right to begin exploitative activities. Further, since the United States and the Soviet Union as major space-resource States have common interests in exploitative activities, it is more likely that their common interests will support common exploitative efforts. At the present time there is no evidence that they will pose objections to exploitative activities.

A third criticism of the Moon Treaty is that it is hostile to those States which are based on the free-enterprise system. More particularly, it has been asserted that investors domiciled in private-enterprise countries will be reluctant to engage in exploitative activities pending further clarification of the enterpriser's right to profit from the use of that technology.[195] This outlook, if valid, could impose constraints on future exploitative activity. However, the international legal order that has emerged particularly since the acceptance of the 1967 Principles Treaty by about 80 countries, including all of the space-resource States, has patently made provision for free use of and access into the space environment. The Moon Treaty is not designed to turn the clock back on this major achievement. Rather, the Treaty, through the establishment of legal rights and duties, has sought to normalize and regularize the rights to exploit the particular resources identified in the Treaty.

While the acceptance of the CHM principle in the Treaty may require the sharing of some of the benefits realized from the exploitative process, this cannot be treated as a device to eliminate the profits earned through the taking of risks under the free-enterprise system. In the minds of many the clarification of the international legal regime allowing for such exploitative activity will encourage rather than restrict both the free-enterprise and other economic systems to engage in economically viable space activity. Unlike the present provision in the 1979 Law of the Sea Negotiating Text, which calls for the establishment of a carefully structured institution for the management of the manganese nodule resource, the Moon Treaty

contains no comparable provisions. The Moon Treaty simply contemplates that a suitable regime is to be formed at a future date depending on the then present scientific facts pertaining to the full exploitability of the natural resources of the Moon.

Finally, there has been a disposition on the part of the critics of the Treaty to read its terms only in a highly restrictive and essentially literal sense. One illustration is the attempt to identify the meaning of the terms "scientific investigation" and "scientific investigations" as they appear in Article 6, paragraph 2 in an artificial and limited way.[196] Since these expressions do not exclude the inherent elements of research and development as a part of such scientific inquiry, no good reason appears to exist to assert that research and development having the purpose of advancing scientific investigation may not be permissible. Since scientific investigations have resulted in commercial products—as in the United States space program—it is not likely that the United States and other States that have benefited from such activities will be heard to argue that scientific investigation must be divorced from modern technology and consumer benefits.

If there are valid criticisms to the Moon Treaty they do not include those just identified. The nature of the world's political-legal preferences are such that mere apprehensions as to the application of the CHM principle in the work-a-day world provide no valid basis for objection to the most recent consensus conclusions of COPUOS. The political-legal base accorded to the CHM principle through the consensus diplomacy of COPUOS will allow for the lawful exploitation of the natural resources of the Moon and other celestial bodies. The other terms of the treaty will also contribute to the realization of important values in the space environment by all States and their materials.

A somewhat different form of criticism, which although raised and apparently disposed of by COPUOS, continues to be directed toward the lack of a formal definition of CHM in the Treaty. This form of criticism comes from those who, when confronted by innovative terms such as mankind or CHM, seek to advance a definition of a concept or of an idea. In this connection it should be kept in mind that while definitions may be suitable for a specific object, having, for example, tangible qualities, or for private relationships, as in a contract situation, the utility of endeavoring to define a principle may be questioned. It is generally acknowledged that principles do not lend themselves readily to definitional labels. The latter serve as arbitrary limitations on growth and destroy the usefulness of principles.

Nonetheless, some policy purposes may be advanced by those who are imbued with a definitional propensity. For example, it may be imagined that through a definition it would be possible to achieve a degree of present specificity, with this being regarded as a suitable value. Unfortunately, for this perspective the history of the law has demonstrated that words have a habit of changing their meanings. As a result a definitional fetish may produce deep-seated frustrations.

In the search for the anticipated security of a present definition, and in the absence of experience as to how the concept or principle has actually functioned, there have been complaints raised as to the novelty, generality, philosophical underpinnings—as opposed to legal—, and the uncertain historical pedigree of the challenged concept. Other false guidelines have been references to the literal meaning ascribed to the indicated term on the basis of a reference to a dictionary. Flawing such definitional efforts have been failures to recognize that such concepts frequently possess the quality of creative principles with the essential quality of starting points for legal reasoning. Such definitional approaches may contribute more to the obscuring of goals than to providing guidance in the use of the yet unperfected and unexplored concept. In short, such definitional approaches may serve more to prevent the gathering of practical meaning than to enhance it.

Another enemy of the legal principle is provincialism. This occurs when an effort is made to fashion an understanding of what is now from a limited experience with the municipal law that is dominant in a given State. A wider parochialism has occurred when an attempt is made to impose on a new concept, such as that of "mankind," meanings which have their roots only within a given legal system.

When such inelastic definitional and provincial biases are put aside an opportunity then is afforded to seek to understand the function of such words and expressions and to put utilitarian meanings into the new ideas. This can result in the identification of suitable components, and agreement can be reached as to their relevance and worth. Further, they can be tested in practical situations to determine if they are delivering a political-legal product worthy of acceptance and retention.

In the international law of the space environment what has been said has particular application to the "common interest of mankind" as set out in General Assembly Resolution 1974 (XIV), the "province of all mankind" as contained in Article 1 of the 1967 Principles Treaty, and the CHM principle as accepted in Article 11 of the

Moon Treaty. From the context of space uses and activities and through an understanding of the purposes to be served by the international law of the space environment, it will be possible to determine the meaning of such concepts and principles. From this perspective the condition, identified as the "'mankind' syndrome,"[197] offers considerable guidance as juridical and natural persons in the formulation of procedures and practices allowing for the orderly exploration, use, and exploitation of the Moon and its natural resources. Giving substance to the CHM concept and allowing for its utilitarian use for the benefit of juridical and natural persons are Articles 6, 8, 11, and 18 of the Moon Treaty. They, when read in the light of the Moon Treaty negotiations, provide suitable and adequate guidance to the implementation of the CHM principle.

CONCLUSION

The Moon Treaty, like all of the other space environment treaties following the 1967 Principles Treaty, fortifies and extends certain critical provisions of the latter. The Moon Treaty has made a most important contribution to the clarification of international space law by reemphasizing the principle that the Moon is not subject to sovereign appropriation. By comparison, however, the Treaty makes provisions for the exercise of property and ownership rights respecting those natural resources that have been removed from the surface or the subsurface of the Moon. Thus, provision is made for the exploration and use of the Moon and its natural resources, including their exploitation for commercial purposes as well as for scientific purposes. The exploitation for commercial purposes is made subject to the fact that the Moon and its natural resources are the CHM.

The Moon Treaty goes beyond making a distinction between the non-exercise of national sovereignty and the existence of public and private property rights. As to property rights the Treaty prevents the acquisition of property rights to spatial areas such as the Moon. It also specifically prohibits the acquisition of property rights in the surface or subsurface of the Moon and to natural resources in place. Thus, the Treaty allows for exploitation by both public and private legal persons of natural resources that have been reduced to possession by the act of removing them from their original in place location. Once such materials and resources are no longer in place the possessor may maintain proprietary rights. The Treaty in taking cognizance of the emergence of such exploitative activity has provided for a subsequent convening of an international conference to formulate a regime whereby larger and more extensive exploitation activities will be brought within the CHM principle. The Treaty does not impose a moratorium on such exploitative activity not on the acquisition of property rights with regard to such natural resources pending the convening of the identified conference.

During the negotiation of the terms of the Moon Treaty, lasting from the Argentinian original proposal in 1970 to July 1979, particular difficulties were encountered in reaching consensus on the use and exploitation of natural resources, on limits to be imposed on ownership and property rights, and the CHM principle. During the decade of negotiations a variety of views were put forward on these subjects by legal authorities and by COPUOS participants. The negotiations were marked by many innovative suggestions and by a willingness of the commentators and negotiators to modify positions initially favored.

Originally the Soviet Union was opposed to the CHM principle. Further, Soviet spokesmen initially objected to the right of private legal persons to engage in exploitative activity relating to the natural resources of the Moon. The less-developed countries periodically urged the view that there should be a moratorium on the exploitation of the Moon's natural resources. They also supported the view that such resources, if they were to be used, should be used only on the surface of the Moon. At the outset there was sentiment in favor of applying the CHM principle only to the Moon, but not to its natural resources. During the drafting period some States urged that the Moon's natural resources should be used only for scientific purposes. At the end all of these positions had been abandoned and affirmative provisions are contained in the Treaty allowing for the use and exploitation of the Moon and its natural resources pursuant to the CHM principle and for both scientific and commerical purposes. Such use and exploitation of natural resources by public and private legal persons, as has been emphasized, is limited to resources no longer in place. The reason for this limitation is not to prevent such exploitation and use but rather is intended to assure that there not be claims to sovereign rights to the surface or subsurface of the Moon as a result of such exploitative activity. By allowing for the indicated exploitative activity the Moon Treaty conforms to the underlying thesis of the 1967 Principles Treaty that the space environment should be explored and used and that access to the area for peaceful uses and activities should not be restricted.

During the negotiations a number of suggestions were put forward that would have produced legal consequences for human activity on the Moon. It was suggested that the Moon and its natural resources should be given a continental shelf status. Some scholars favored giving the UN public sovereignty and private property rights over the Moon and its natural resources. Others would have denied the entire possibility of obtaining legal title to the Moon's materials and resources. Others would have rejected the traditional res communis principle, and Professor Cocca would have enlarged and extended the res communis principle through acceptance of the res communis humanitatus concept. While the later proposal has a close affinity with the CHM principle, all of the other proposals did not survive the assessments of the commentators and the COPUOS negotiations.

Articles 6, 8, 11, and 18, as well as the Preamble, are most directly relevant to the use and exploitation of the Moon. Article 6, in assuring the freedom of scientific investigation, refers to the collection, use, and removal of Moon samples or its mineral and other substances. It does not use the terms found in Article 11, namely, natural resources. Article 6 by guaranteeing the freedom of scientific investigation does not restrict human activity exclusively to scientific activity. By allowing for the use of such mineral and other substances in support of man's missions on the Moon it is clear that the Treaty contemplates the presence of human activity more extensive than scientific inquiry. This Article does not deny the use of the Moon and its natural resources for other activities. Moreover, by encouraging scientific activity this Article lays the foundation for the more advanced exploitation contemplated in Articles 11 and 18. Article 8 identifies where exploitative activity may take place, namely, on or below the surface of the Moon.

Article 11, by providing that the CHM principle appertains to the Moon and to its natural resources, advances the international law of the space environment well beyond the terms of the 1967 Principles Treaty. The CHM principle is consistent with the provisions of Article 2 of the Principles Treaty preventing the sovereign appropriation of the space environment. The CHM principle takes account of the need of States and peoples to utilize natural resources for their general well-being in an era in which natural resources are in increasing demand. The CHM principle is identified in detail in Article 11 so that those who are engaged in exploitative activities will understand the nature of their rights and duties as they make use of the indicated natural resources. States that become bound by the Moon Treaty will, pursuant to Article 18, be obliged to work out a more detailed international regime for the governance of the Moon and the larger exploitation of its resources over time. States will be expected to adopt national legislation whereby they will comply with the international standards fixed in Article 11 and in any subsequent requirements formulated by the future regime. The Treaty's provisions specifically enable both public and private legal persons—without regard for the national social-political structure of any State—presently to engage in exploitative activities. The Treaty is neither based for or against States organized upon a free-enterprise or a socialist preference. It does not prohibit exploitation pending the establishment of the future regime.

In its present form the Moon Treaty is designed to assist in the exploration, use, and exploitation of the Moon and its natural resources. All of the members of COPUOS, industrial States and LDCs alike, perceive that through the CHM principle exploitation is now permissible. They are also aware that over time there is a probability that the economic and scientific benefits of exploitation and use will be maximized.

The Moon Treaty is an affirmative step toward insuring that exploitation and use will take place in an orderly manner under applicable international law. The outcome will be more than an orderly structure for the exploitation and use of the Moon and its natural resources. There will also be, pursuant to the CHM principle, an orderly process for the sharing of the benefits derived from the exploitation and use of increasingly important resources. Such sharing, as the Treaty explicitly provides, is to be based on equitable considerations. This does not mean that there will be equal sharings. Those who have taken the risks of exploitative activity will still be allowed to realize the benefits flowing from their initiatives, enterprise, and successes. Pursuant to the spirit underlying the Treaty all mankind will be the ultimate beneficiaries.

References

1. U.N. Doc. A/34/20, 1979. It will be referred to as the Moon Treaty.

2. 18 UST 2410, TIAS 6347, 610 UNTS 205. It entered into force for the United States on October 10, 1967. It will be referred to as the Principles Treaty. At present it is in force for over 80 States including all of the space-resource States.

3. The res communis humanitatus concept has been considered by its proponents to be an augmentation of the res communis principle as it related to the Moon and other celestial bodies.

A function of the concept was to "avoid the legal vacuum of non-appropriation, nonproperty, non-cession, non-exchange, non-lease, non-sale, non-transfer and so forth." A. A. Cocca, "The Principle of the 'Common Heritage of all Mankind' as Applied to Natural Resources from Outer Space and Celestial Bodies," "Proceedings of the 16th Colloquium on the Law of Outer Space", p. 174 (1974). Applying the concept only to the Moon and other celestial bodies Cocca indicated support coming from a Congress of international lawyers meeting in Buenos Aires in 1969. They concluded that the concept was a "legal condition especially elaborated by law for this new field of human activity, and which is derived from the community of interests and benefits recognized in favor of mankind in outer space and celestial bodies." Ibid. Support for the concept was found to exist in the 1967 Principles Treaty.

4. Other outer space treaties binding the United States and the major space-resource States are the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, December 3, 1968, 19 UST 7570, TIAS 6592, 672 UNTS 119; Convention on International Liability for Damage Caused by Space Objects, October 9, 1973, 24 UST 2389, TIAS 7762; and Convention on Registration of Objects Launched into Outer Space, September 15, 1976, TIAS 8480.

5. Article 13, Draft Treaty Relating to the Moon, U.N. Doc. A/AC.105/101, p. 6, 11 may 1972. This provision was retained in all subsequent drafts and became Article 14 of the Moon Treaty.

6. The early drafts borrowed heavily on provisions contained in the Principles Treaty. V. Kopal, "The Development of Legal Arrangements for the Peaceful Uses of the Moon," "Proceedings of the 15th Colloquium on the Law of Outer Space", p. 161 (1973); M. Smirnoff, "The Need for a Treaty on the Legal Status of the Moon, "Proceedings of the 15th Colloquium on the Law of Outer Space," p. 175 (1973); S. Gorove, "The Draft Treaty Relating to the Moon: An Overview and Evaluation, "Proceedings of the 19th Colloquium on the Law of Outer Space," p. 41 (1977); B. A. Luxenberg, "United Nations Draft Treaty on the Moon," in "World Wide Space Activities," Subcommittee on Space Science and Applications, Committee on Science and Technology, U.S. House of Representatives, 95th Cong., 1st Sess., p. 538 (1977).

7. U.N. Doc. A/AC.105/101, p. 6, 11 May 1972; U.N. Doc. A/AC.105/196, Annex 1, p. 20, 11 April 1977.

8. U.N. Doc. A/AC.105/C.2/L.71 and Corr. 1; U.N. Doc. A/AC.105/85, Annex 2, p. 1, 3 July 1970. Article 1 of the Argentinian Draft Agreement stated: "The natural resources of the Moon and other celestial bodies shall be the common heritage of mankind." Ibid.

9. A. A. Cocca, op. cit., p. 174 (1974).

10. Ibid., p. 173. Compare, A. A. Cocca, "Legal Status of the Natural Resources of the Moon and Other Celestial Bodies," "Proceedings of the 13th Colloquium on the Law of Outer Space," p. 146 (1971). Reference was made in this article to the 1969 initiative of Argentina identifying the legal status of materials, resources, and products of the Moon.

11. There are 47 members of COPUOS coming from all of the principal space-resource States, from many developing countries, from all of the continents, and representing different social-economic perspectives and ideologies.

12. U.N. Doc. A/8391, 4 June 1971. 10 "International Legal Materials" 839 (July 1971). A draft treaty of 15 Articles entitled "Treaty Concerning the Moon" was attached as an Annex.

13. U.N. Doc. A/AC.105/196, Annex 1, 11 April 1977.

14. U.N. Doc. WG.I (1978)/WP.2, 3 April 1978; U.N. Doc. A/AC.105/218, Annex 1, 13 April 1978.

15. U.N. Doc. A/AC.105/101, p. 6, 11 May 1972.

16. U.N. Doc. A/AC.105/115, 27 April 1973; 1 Journal of Space Law, p. 170 (Fall 1973).

17. U.N. Doc. A/AC.105/133, p. 5, 6 June 1974.

18. U.N. Doc. A/AC.105/218, Annex 1, p. 6, 13 April 1978.

19. C. W. Jenks, "The Common Law of Mankind," p. 398 (1962). Compare, Jenks, "Seven Stages in the Development of Space Law," "Proceedings of the 11th Colloquium on the Law of Outer Space," p. 256 (1969).

20. U.N. Doc. A/AC.105/L.2; U.N. Doc. A/5181, Annex 3. In a revised draft of April 16, 1963 the proposal read: "7. All activities of any kind pertaining to the exploration and use of outer space shall be carried out solely by States. If States undertake activities in outer space collectively, either through international organizations or otherwise, each State participating in such activities has a responsibility to comply with the principles set forth in this Declaration." U.N. Doc. A/AC.105/C.2/L.6.

21. Ibid., paragraph 11.

22. U.N. Doc. A/AC.105/L.5; U.N. Doc. A/5181, Annex 3.

23. U.N. Doc. A/C.1/881, p. 23, Article 6.

24. U.N. Doc. A/AC.105/C.2/SR.20, p. 12.

25. U.N. Doc. A/AC.105/PV.22, p. 37.

26. U.N. Doc., A/6352, 16 June 1966.

27. "Space Treaty Proposals by the United States and U.S.S.R., Staff Report," Committee on Aeronautical and Space Sciences, U.S. Senate, 89th Cong., 2d Sess., p. 23 (1966).

28. U.N. Doc. A/6327.

29. 18 UST 2410, TIAS 6347, 610 UNTS 205.

30. "Treaty on Outer Space, Hearings before the Committee on Foreign Relations," U.S. Senate, 90th Cong., 1st Sess., Executive D, p. 63 (1967).

31. Ibid., p. 148. Secretary of State Rusk emphasized that Article 2 of the 1967 Treaty prohibited "national appropriation . . ." and that this provision reinforced the "free-access provisions" of Article 1. Ibid., p. 110.

32. Ibid., p. 27.

33. Ibid.

34. It has been pointed out that Article 2 of the 1967 Principles Treaty did not alter the terms of paragraph 3 of General Assembly Resolution 1962 in which the prohibition of national appropriation applied to outer space, the Moon, and celestial bodies rather than to their

resources, even though the Treaty "remains silent concerning the exploitation of space resources." C. W. Jenks, "Property in Moon Samples and Things Left Upon the Moon," "12th Colloquium on the Law of Outer Space," p. 148 (1970). Jenks also observed that the ownership of Moon samples "vests in the government of the United States through the action of its agents in reducing into possession . . ." such samples. There would not be "any transfer of property" by the United States in voluntarily making such samples available to other States for their scientific investigations. Ibid., p. 149.

35. "Proceedings of the 8th Colloquium on the Law of Outer Space," p. 468 (1966). The Institute has given much attention to the establishment of a legal regime for the Moon and celestial bodies and their natural resources. See the Proceedings of the 9th Colloquium, pp. 8–65 (1967); the 10th Colloquium, pp. 10–63 (1968), as well as contributions in the subsequent Colloquia. For example, the question was asked by C. E. S. Horsford, "What rights accrue as to minerals and other natural resources, and does 'use' include the right to take things from a celestial body?" "Legal Problems Relating to the Establishment of a Station with Personnel on the Moon, Introductory Report," "Proceedings of the 10th Colloquium on the Law of Outer Space," p. 11 (1968). The opinions of the scholars meeting at the annual sessions of the International Institute of Space Law have contributed materially to the present substantive law of the Moon and its natural resources.

36. "Proceedings of the 10th Colloquium on the Law of Outer Space," p. 13 (1968).

37. Ibid.

38. G. P. Zhukov, "Tendencies and Prospects of the Development of Space Law," "Proceedings of the 11th Colloquium on the Law of Outer Space," p. 277 (1969).

39. Ibid., p. 279.

40. R. Mankiewicz, "Intervention with Respect to Permanent Stations on the Moon," "Proceedings of the 11th Colloquium on the Law of Outer Space," p. 163 (1969). In his view the absence of sovereignty would prevent both public and private entities from engaging in the exploitation of the resources of the Moon, since such activity would "constitute appropriation of things which cannot be appropriated and for which, therefore, no legal title can be acquired." Ibid.

41. E. Brooks, "Control and Use of Planetary Resources," "Proceedings of the 11th Colloquium on the Law of Outer Space," p. 348 (1969). He assumed that in such an international body the space-resource States would possess enough influence to be able to receive a commensurate share of benefits.

42. G. P. Zhukov, "The Problem of Legal Status of Scientific Research Station on the Moon," "Proceedings of the 10th Colloquium on the Law of Outer Space," p. 61 (1968).

43. G. C. M. Reijnen, "The History of the Draft Treaty on the Moon," ,"Proceedings of the 19th Colloquium on the Law of Outer Space," p. 366 (1977). However Article 2 only prohibits appropriation of the space environment, per se, not its natural resources.

44. Zhukov, op. cit,, p. 61.

45. Ibid.

46. G. P. Zhukov, "Moon for All States," Space World, p. 45 (July 1968). The continental shelf analogy has been rejected. E. Brooks, op. cit., p. 348. Brooks also opposed the view that a State may assert a claim to a section of the Moon in order to put forward a claim for exclusive uses of planetary resources. Ibid., p. 341.

47. E. Fasan, "Legal Problems for Celestial Bodies and their Solution," "Proceedings of the 9th Colloquium on the Law of Outer Space," p. 54 (1967).

48. Ibid., compare F. G. Rusconi, "The Legal Status of Heavenly Bodies," "Proceedings of the 9th Colloquium on the Law of Outer Space," p. 62 (1967); see also C. E. S. Horsford, "The Need for a Moon Treaty and Clarification of the Legal Status of Space Vehicles," "Proceedings of the 9th Colloquium on the Law of Outer Space," p. 48 (1967).

49. The potential inconsistency between these articles had been noted by the French representative in COPUOS during the 1966 debates on the treaty. He indicated that it would be necessary "to decide how far the principle of non-appropriation, was compatible with effective exploration and exploitation, for the same resolutions that forbade the appropriation of celestial bodies encouraged their use." U. N. Doc. A/AC.105/C/2/SR.57, p. 16. The two articles were considered to be fully compatible by Secretary of State Rusk. Goldberg, "Treaty on Outer Space," op. cit., p. 110.

50. Brooks, op. cit., p. 340.

51. C. W. Jenks, "Space Law" p. 202 (1965).

52. Brooks, op. cit., p. 341.

53. For example, the Belgian representative had stated on August 4, 1966 that "His delegation had taken note of the interpretation of the term 'non-appropriation' advanced by several delegations—apparently without contradiction—as covering both the establishment of sovereignty and the creation of titles to property in private law." U. N. Doc. A/AC.105/C.2/SR.71 and Add., p. 7.

54. Brooks, op. cit., p. 344.

55. Goldberg, "Treaty on Outer Space," op. cit., p. 21.

56. Brooks, op cit., p. 346

57. Ibid.

58. M. A. Ferrer, "Activities on Celestial Bodies Including the Exploitation of Natural Resources," "Proceedings of the 12th Colloquium the Law of Outer Space," p. 142 (1970).

59. Ibid., p. 146.

60. L. Szaloky, "Activities on Celestial Bodies Including the Exploitation of Possible Natural Resources There," "Proceedings of the 12th Colloquium on the Law of Outer Space," p. 178 (1970).

61. Ibid. In his view exploitation under international law would require the promulgation by States of civil law rules and administrative regulations.

62. T. Salinas, "Summary of Discussions," "Proceedings of the 12th Colloquium on the Law of

Outer Space," p. 199 (1970). This view was supported by Fernandez-Brital, "Activities on Celestial Bodies, including Exploitation of Natural Resources," "Proceedings of the 12th Colloquium on the Laws of Outer Space," p. 197 (1970).

63. S. M. Williams, "Utilization of Meteorites and Celestial Bodies,' "Proceedings of the 12th Colloquium of the Law on Outer Space," p. 182 (1970).

64. A. A. Cocca, "The Principle of the 'Common Heritage of All Mankind' as Applied to Natural Resources from Outer Space and Celestial Bodies," "Proceedings of the 16th Colloquium on the Law of Outer Space," p. 174 (1974).

65. Ferrer, op. cit., p. 142 and p. 146. Compare S. M. Williams, "The Principle of Non-Appropriation Concerning Resources of the Moon and Celestial Bodies ," "Proceedings of the 13th Colloquium on the Law of Outer Space," p. 157 (1971).

66. Salinas, op. cit., p. 199.

67. Ferrer, op. cit., p. 146.

68. Ibid., p. 144.

69. Ibid., p. 145.

70. Brooks, op. cit., p. 346.

71. Williams, "Proceedings of the 12th Colloquium," op. cit., p. 183.

72. Ibid.

73. Ibid., p. 183.

74. Williams, "The Principle of Non-Appropriations Concerning Resources of the Moon and Celestial Bodies," "Proceedings of the 13th Colloquium on the Law of Outer Space," p. 159 (1971).

75. Ibid., pp. 158–159. Perhaps it was her view that the exploitation of such resources was permissible. However, the term used by her was "appropriation." Further, it appears that she favored such "appropriation" or "exploitation" by both private legal persons as well as by States. This view of her comments is supported by her general outlook that mankind should benefit from space activity and from her statement that the 1970 COPUOS proposal of Argentina was consistent with and an elaboration of the 1967 Principles Treaty.

76. Fernandez-Brital, op. cit., p. 198.

77. Szaloky, op. cit., p. 178.

78. Ibid., p. 178.

79. F. G. Rusconi, "Regime of the Property of the Natural Resources of the Moon and Other Celestial Bodies," "Proceedings of the 12th Colloquium on the Law of Outer Space," p. 186 (1970).

80. Ibid., p. 188.

81. U.N. Doc. A/AC.105/115, 27 April 1973; 1 Journal of Space Law, p. 170, No. 2 (1973).

82. E. G. Vassilevskaya, "Legal Regulation of Activities on the Moon for the Cause of Peace and Progress," "Proceedings of the 15th Colloquium on the Law of Outer Space," p. 178 (1973).

83. V. Kopal, "The Development of Legal Arrangements for the Peaceful Uses of the Moon," "Proceedings of the 15th Colloquium on the Law of Outer Space," p. 163 (1973).

84. M. T. Curia, "Legal and Doctrinary Basis of an International Agreement Concerning Natural Resources Originating in the Moon and Other Celestial Bodies," "Proceedings of the 13th Colloquium on the Law of Outer Space," p. 155 (1971).

85. Ibid., p. 156.

86. I. H. Diederiks-Verschoor, "Legal Aspects of Laboratories on the Moon," "Proceedings of the 14th Colloquium on the Law of Outer Space," p. 25 (1972).

87. Ibid.

88. "Introduction to Outer Space, An Explanatory Statement by the President's Science Advisory Committee," p. 1 (1958).

89. These and illustrations drawn from other space environment documents, Human Rights documents, Law of the Sea documents, and the 1959 Antarctica Treaty are collected in C. Q. Christol, "The Legal Common Heritage of Mankind: Capturing an Illusive Concept and Applying It to World Needs," "Proceedings of the 18th Colloquium on the Law of Outer Space," p. 42 (1976). Compare E. Fasan, "The Meaning of the Term 'Mankind' in Space Legal Language," 2 Journal of Space Law, p. 125, No. 2 (Fall 1974); N. M. Matte, "The Draft Treaty on the Moon, Eight Years Later," 3 Annals of Air and Space Law/Annales de droit aerien et spatial, p. 531 (1978); S. B. Rosenfield, "Solar Energy and 'The Common Heritage of Mankind,'" "Proceedings of the 21th Colloquium on the Law of Outer Space," p. 58 (1979); S. B. Rosenfield, "Article XI of the Draft Moon Treaty," "Proceedings of the 22nd Colloquium on the Law of Outer Space," in print (1980); E. R. Finch, Jr., "1979 United Nations Moon Treaty Encourages Lunar Mining and Space Development," Ibid.; and E. R. Finch, Jr., "In Favor of the Moon Treaty," L–5 News, Vol. 4, No. 11, p. 7 (November 1979).

90. 18 UST 2410; TIAS 6347; 610 UNTS 205.

91. Public Law 85–568, 72 Stat. 426.

92. Goldberg, "Treaty on Outer Space," op. cit., p. 56.

93. Ibid., pp. 69–70.

94. Ibid., p. 70.

95. Ibid., p. 21.

96. Executive Report No. 8 To Accompany Ex. D., U.S. Senate, 90th Cong., 1st Sess., p. 4 (1967).

97. The respective drafts of the Law of the Sea treaty have provided that "The Area and its resources are the common heritage of mankind." The most recent draft is contained in the "Informal Composite Negotiating Text/Revision 1," U.N. Doc. A/CONF.62/WP.10/Rev. 1, 28 April 1979; 18 International Legal Materials 686 (May 1979). Unlike the Moon Treaty the law of the sea draft treaty does not define the spatial area within which the principle is to be applicable. The world tendency to identify common resources as appertaining to the service of "all humanity" is also reflected in the Preamble to the 1971 INTELSAT Agreement. 23 UST 3813, TIAS 7532.

98. U.N. Doc. A/34/20 (1979).
99. Ibid.
100. In commenting on the 1973 COPUOS draft Vassilevskaya noted that it contained a new proposal providing that "due regard to the interests of present and future generations should be taken into account." Vassilevskaya, op. cit., p. 178 (1973). In commenting on the 1973 draft Kopal also pointed out the presence of the provision in Article 4 referring to the interests of present and future generations. Kopal, op. cit., p. 156. While observing that the square-bracketed provisions of Article 10 of the draft called for the natural resources of the Moon to be treated as the CHM, he considered that "countries conducting expensive explorations of those areas must be allowed to use reasonable quantities of resources on the spot for different needs of their exploration activities." Ibid., p. 163. His observation focused on the practical probability that States would be able to engage in such exploitative conduct.
101. C. Q. Christol, "Large Space Systems: Problems and Prospects," 7 "Acta Astronautica," 1979, in press; see also, A. A. Cocca, "The Principle of the 'Common Heritage of all Mankind' as Applied to Natural Resources from Outer Space and Celestial Bodies," op. cit., p. 175; M. E. Picarel, "Algunus Consideraciones Sobre el Producto Lunar," "Proceedings of the 12th Colloquium on the Law of Outer Space," p. 189 (1970). It has been suggested that the CHM principle also contains those assurances set out in the 1959 Antarctic Treaty and the 1967 Principles Treaty relating to the communication of information. G. Wolff, "Le Projet de Traite sur la Lune: Sa Place Dans l'Evolution du Droit International Public," "Proceedings of the 16th Colloquium on the Law of Outer Space," p. 205 (1974).
102. U.N. Doc. A/34/20 (1979).
103. Article 18 contemplates the revision of the Treaty. It articulates procedures, and provides that "A review conference shall consider the question of the implementation of the provisions of Article XI, paragraph 5, on the basis of the principle referred to in paragraph 1 of that article and taking into account in particular any relevant technological developments."
104. Critical of this effort has been Leigh S. Ratiner in testimony before the Subcommittee on Space Science and Applications of the Committee on Science and Technology, U.S. House of Representatives, September 6, 1979. Cited hereafter as Ratiner, Statement. He told the Subcommittee that "One marvels at the arrogance of those who would even feel qualified to subject such vastness beyond our understanding and reach to an elaborate legal regime governing future generations' needs and patterns of growth." Statement, p. 2. However, since 1959 the United Nations has demonstrated that the space environment is to be used to benefit the needs of Earth-bound humanity. United Nations Ad Hoc Committee on Peaceful Uses of Outer Space, Report to the General Assembly, U.N. Doc. A/4141, 14 July 1959.
105. See, for example, the Ratiner statement. Ibid. See also Arthur M. Dula, "Free Enterprise and the Proposed Moon Treaty, Part I, L-5 News, Vol. 4, No. 10, p. 1 (October 1979). For example, Ratiner refers to such terms as "for the benefit and in the interests of all countries," "sovereignty," and "property" as contained in the 1967 Principles Treaty and in the Moon Treaty as "catch-phrases." Statement, op. cit., p. 5, fn. His lengthy testimony is given over almost entirely to an assessment of issues before the Third UN Conference on the Law of the Sea from the perspective that texts emerging from that conference would result in "special discrimination" against the advanced States. Ibid., p. 8. For a perceptive assessment of the Ratiner statement see W. J. Broad, "Earthlings at Odds Over Moon Treaty," 206 Science, p. 915 (23 November 1979).
106. These principles are characterized by territorial, nationality, universality, protective, and passive personality considerations.
107. U.N. Doc. A/AC.105/C.2/L.71 and Corr. 1; U.N. Doc. A/AC.105/85, Annex 2, p. 1.
108. Ibid. This Argentinian initiative was described by Professor A. A. Cocca in "Legal Status of the Natural Resources of the Moon and Other Celestial Boones," "Proceedings of the 13th Colloquium on the Law of Outer Space," p. 146 (1971).
109. U.N. Doc. A/AC. 105/101, p. 6, 11 May 1972; U.N. Doc. A/AC.105-196, Annex 1, p. 13, 11 April 1977. At the 1973 meeting of the International Institute of Space Law a number of Experts reviewed the status of the draft Moon Treaty. Their articles are published in the "Proceedings of the 16th Colloquium on the Law of Outer Space:" S. Gorove, "Property Rights in Outer Space: Focus on the Proposed Moon Treaty," p. 177; V. Kopal, "Legal Questions Relating to the Draft Treaty Concerning the Moon," p. 180; F. Rusconi and C. Paz-Perina, "Proyecto de Tratado Relativo a la Lulna Usos Pacificos y Desarme: Dos Aspectos de una Misma Realidad," p. 190; L. Szaloky, "The Way of the Further Perfection on the Legal Regulation Concerning the Moon and Other Celestial Bodies, Especially Regarding the Exploitation of Natural Resources of the Moon and Other Celestial Bodies," p. 196.
110. U.N. Doc. A/8391, 4 June 1971.
111. Ibid., p. 4. This proposal with important changes became Article 11, paragraph 3 of the 1979 Moon Treaty.
112. G. Zhukov, "The Legal Regime for the Moon (Problems and Prospects)," "Proceedings of the 14th Colloquium on the Law of Outer Space," p. 50 (1972).
113. U.N. Doc. A/AC.105/C.2(XI)/ Working paper 12, U.N. Doc. A/AC.105/196, Annex 1, p. 23, 11 April 1977.
114. U.N. Doc. A/AC.105/C.2(XI) Working paper, U.N. Doc. A/AC.105/196, Annex 1, p. 23, 11 April 1977.
115. pp.23-24.
116. Ibid.
117. U.N. Doc. A/AC.105/101, p. 6, 11 May 1972; U.N. Doc. A/AC.105/196, Annex 1, p. 10, 11 April 1977.
118. Ibid., p. 11.
119.U.N. Doc. A/AC.105/196, Annex 1, p. 11, 11 April 1977.
120. Ibid, p.12. This position agreed with that of Ambassodor Goldberg in his testimony on the Principles Treaty. Goldberg, "Treaty on Outer Space," opo. cit., p. 56.

121. U.N. Doc. A/AC.105/196, Annex 1, p. 12, 11 April 1977.
122. Ibid.
123. N. M. Matte, "Draft Treaty on the Moon Eight Years Later," op. cit., p. 531 (1978).
124. R. V. Dekanozov, "Draft Treaty Relating to the Moon and the Legal Status of its Natural Resources," "Proceedings of the 20th Colloquium the Law of Outer Space," p. 198 (1978).
125. Dekanozov, "Relationship between the Status of Outer Space and the Statuses of Areas Withdrawn from State Sovereignty," "Proceedings of the 16th Colloquium on the Law of Outer Space," p. 10 (1974).
126. Ibid.
127. Dekanozov, "Juridical Nature of Outer Space Including the Moon and Other Celestial Bodies," "Proceedings of the 17th Colloquium of the Law of Outer Space,"pp. 200–207 (1975); Dekanozov, "Draft Treaty Relating to the Moon and the Legal Status of its Natural Resources," "Proceedings of the 20th Colloquium of the Law of Outer Space."pp. 197–200 (1978).
128. Ibid., p. 199.
129. Ibid., p. 198.
130. E. G. Vassilovskaya, "Legal Problems of the Exploration of the Moon and Other Planets," "Proceedings of the 16th Colloquium on the Law of Outer Space," p. 170 (1974).
131. Ibid.
132. E. G. Vassilolvskaya, "Drawing up a Draft Treaty on the Moon—A Further Contribution to the Progressive Developoment of International Space Law," "Proceedings of the 19th Colloquium on the Law of Outer Space," p. 10 (1977).
133. U.N. Doc. A/AC.105/196, Annex 1, p. 13, 11 April 1977.
134. U.N. Doc. A/AC.105/115, Annex 1, pp. 11–20 27 April 1973: U. N. Doc. A/AC.105/133, p. 5, 6 June 1974.
135. U.N. Doc. A/AC.105/196, Annex 1, p. 18, 11 April 1977.
136. U.N. Doc. A/AC.105/196, Annex 1, p. 14, 11 April 1977.
137. Ibid., p. 15.
138. Ibid., p. 16. For an assessement of the Argentinian response to the Soviet interpretation of the CHM principle see A. A. Cocca, "The Principle of the 'Common Heritage of all Mankind' as Applied to Natural Resources from Outer Space and Celestial Bodies," "Proceedings of the 16th Colloquium on the Law of Outer Space," p.172 (1974).
139. U.N. Doc. A/AC.105/196, Annex 1, pp. 16–17, 11 April 1977. This proposal, with modest drafting changes, became the first sentence of Article 11, paragraph 3, of the Moon Treaty. The terms of paragraph 3, insofar as they make a distinction between in place and not-in-place resources, can be traced back to the 1970 Argentinian draft agreement. Article 3 of that draft provided that "The legal system applicable to natural resources used in their place of origin shall be distinct from that applicable to those brought to the Earth for use." U.N. Doc. A/AC.105/C.2/L.71 and Corr. 1.; U.N. Doc. A/AC.105/196, Annex 1, p. 21, 11 April 1977. Support for such a distinction can be found in the existence of different legal regimes for resources lying beyond national jurisdiction and those within national territories. A. A. Cocca, "Legal Status of the Natural Resources of the Moon and Other Celestial Bodies," "Proceedings of the 13th Colloquium on the Law of Outer Space," p. 148 (1971).
140. S. N. Hosenball, "Current Issues of Space Law Before the United Nations," 2 Journal of Space Law, p. 9, No. 1 (Spring 1974).
141. Ibid. This issue was resolved in paragraphs 3 and 5 of Article 11 of the Moon Treaty which does not make reference to a moratorium and which allows for exploitative activities relating to natural resources not-in-place.
142. U.N. Doc. A/AC.105/196, Annex 1, p. 13.
143. Ibid.
144. I. H. Ph. Diederiks-Verschoor and W. P. Gormley, "The Future Legal Status of Non-governmental Entities in Outer Space: Private Individuals and Companies as Subjects and Beneficiaries of International Space Law," 5 Journal of Space Law, p. 140, Nos. 1 and 2 (1977).
145. U.N. Doc. A/AC.105/196, Annex 1, p. 17, 11 April 1977.
146. Ibid.
147. H. Reis, Press Release USUN–37 (73), p. 5, 19 April 1973. Mr. Reis represented the United States on the Legal Sub-Committee of COPUOS.
148. This proposed right was set forth in Article 5 of the 1973 COPUOS draft. U.N. Doc. A/AC.105/115, 27 April 1973. This right was preserved in Article 6, paragraph 2, of the 1979 Moon Treaty.
149. This understanding allowed them to agree on the terms of Article 11, paragraph 3, of the 1979 Moon Treaty. This provided that "Neither the surface not the subsurface of the Moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person." However, this limitation, together with the others set out in this Article were to be without prejudice to the proposed future international regime. Pending the formation of such a regime the language of paragraph 3 by allowing for the acquisition of property rights in not-in-place materials has clarified the right of space-resource States to take possession and control of such materials. Compare, S. Gorove, "Legal Resources of the Natural Resources of the Moon and Other Celestial Bodies," "Proceedings of the 16th Colloquium on the Law of Outer Space," p. 178 (1974).
150. U.N. Doc. A/AC.105/171, Annex 1, p. 2, 28 May 1976; U.N. Doc. A/AC.105/196, Annex 1, p. 4, 11 April 1977.
151. Ibid.
152. U.N. Doc. A/AC./171, Annex 1, p. 3, 28 May 1976; U.N. Doc. A/AC.105/196, Annex 1, pp. 4–5, 11 April 1977.
153. U.N. Doc. A/AC.105/196, Annex 1, p. 19, 11 April 1977.
154. U.N. Doc. WG.I(1978)/WP.3, 3 April 1978; U.N. Doc. A/AC.105/218, Annex 1, 13 April 1978.

155. K. Chen, "Pending Issues Before the Legal Sub-Committee of the United Nations Committee on the Peaceful Uses of Outer Space," 5 Journal of Space Law, p. 30, Nos. 1 and 2 (1977).
156. Ibid., p. 30.
157. This last assertion was contained in Article 8, paragraph 1 of the 1971 Soviet draft Treaty Concerning the Moon.
158. U.N. Doc. A/34/20 (1979).
159. U.N. Doc. A/34/20, paragraph 65, p. 11 (1979).
160. U.N. Doc. A/AC.105/PV.203, pp. 23–25, 16 July 1979.
161. Ibid., p. 22.
162. Ibid.
163. Ibid.
164. Ibid.
165. Ibid., p. 26.
166. U.N. Doc. A/AC.105/PV.203, pp. 43–45, 16 July 1979.
167. S. N. Hosenball, "Statement," Subcommittee on Space Science and Applications, Committee on Science and Technology, U.S. House of Representatives, September 6, 1979. Cited hereafter as "Statement."
168. U.N. Doc. A/AC.105/218, Annex 1, p. 6, 13 April 1978.
169. U.N. Doc. A/AC.105/240, Annex 3, p. 5, 10 April 1979.
170. Hosenball, "Statement," op. cit., pp. 6–7.
171. Ibid., pp. 8–14.
172. Ibid., pp. 10–11.
173. U.N. Doc. A/AC.105/C.2(XI)/Working Paper 15, U.N. Doc. A/AC.105/196, Annex 1, p. 16, 11 April 1977.
174. Quoted by Hosenball, "Statement," op. cit., p. 11, Article X of the 1973 draft became Article 11 of the 1979 Moon Treaty.
175. Ibid.
176. U.N. Doc. A/AC.105/PV.203, p. 22, 16 July 1979.
177. Hosenball, "Statement," op. cit., pp. 12–13.
178. Ibid., p. 13. The 1979 Report of COPUOS does contain the foregoing words. U.N. Doc. A/34/20, paragraph 62, p. 11 (1979).
179. Hosenball, "Statement," op. cit., p. 13.
180. Ibid.
181. Ibid., pp. 13–14; U.N. Doc. A/AC.105/PV.203, pp. 25–26, 16 July 1979.
182. U.N. Doc. A/34/20, paragraph 63, p. 11 (1979).
183. Ibid.
184. Ibid.
185. TIAS 8572.
186. U.N. Doc. A/AC.105/PV.191, p. 13, 19 June 1979. A U.S. representative has observed that "the negotiations in the U.N. Conference on the Law of the Sea with respect to an international authority for mining manganese nodules on the deep seabed beyond the limits of national jurisdiction, have so sensitized the international community that many of the less-developed countries have sought to bring basic elements of the seabed authority being negotiated into the prospective moon treaty." H. Reis, International Space Law, Hearings before the Subcommittee on Space Science and Applications of the Committee on Science and Technology, U.S. House of Representatives, 94th Cong., 2nd Sess., p. 31 (1976).
187. U.N. Doc. A/CONF.62/WP.8/Rev./Part I; U.N. Doc. A/CONF.62/WP.10/Rev. 1, 28 April 1979. For an analysis of the development of the CHM principle in both the Law of the Sea negotiations and the negotiations for a Moon Treaty down to July 1976, see, C. Q. Christol, International Space Law, Hearings before the Subcommittee on Space Science and Applications of the Committee on Science and Technology, U.S. House of Representatives, 94th Cong., 2nd Sess., pp. 2–17 (1976).
188. Ratiner, "Statement," op. cit., p. 12.
189. Ratiner, "Statement," op. cit., p. 7 and pp. 13–14.
190. U.N. Doc. A/AC.105/PV.203, pp. 23–25, 16 July 1979. Italics added to indicate that this is a present right.
191. U.N. Doc. A/8391, Article 8, paragraph 1, 4 June 1971.
192. Hosenball, "Statement," op. cit., p. 11.
193. U.N. Doc. A/34/20, paragraphs 55–56, pp. 10–12 (1979).
194. For example, it has been imagined that "it is clear beyond reasonable doubt that the U.S.S.R. and its supporters in COPUOS have and are executing a careful and deliberate program intended to limit the entry of free enterprise into space." Arthur M. Dula, "Free Enterprise and the Proposed Moon Treaty, Part II," L–5 News, Vol. 4, No. 11, p. 7 (November 1979). The law and practice evolving from the 1967 Principles Treaty clearly denies success to such a maneuver.
195. Ratiner, "Statement," op. cit., pp. 13–14.
196. Dula, op. cit., p. 5.
197. A. Bueckling, "The Strategy of Semantics and the 'Mankind Provisions' of the Space Treaty," 7 Journal of Space Law, p. 15, No. 1 (Spring 1977).

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, D.C., June 17, 1980.

Gen. ALEXANDER HAIG,
President and Chief Operating Officer, United Technologies Corp., United Technologies Building, Hartford, Conn.

DEAR GENERAL HAIG: On July 29 and 31, 1980, the Subcommittee on Science, Technology, and Space will hold hearings on the proposed "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies."

It is our understanding that when you were on the staff of the President your official approval was given to the United States policy embodied in the text of the Agreement during the 1972–73 negotiations of the United Nations Committee on the Peaceful Uses of Outer Space, Legal Subcommittee. The major elements of this early policy are still embodied in the final text endorsed by the United Nations General Assembly on December 5, 1979.

The Agreement has become an issue which is being debated pro and con. The purpose of our hearings is to obtain objective, factual information for the purpose of making prudent decisions. We would appreciate receiving a letter expressing your views on the proposed Agreement so that they may be published in the forthcoming hearings. Since the Agreement has been related by some to the U.N. Law of the Sea Treaty, now under negotiation, because both embody the "common heritage of mankind" principle in their text, we also would appreciate your view on this particular point in terms of the best future course for the United States.

Enclosed is a copy of a Committee Print prepared for this Committee to provide some background on this Agreement.

With every good wish,
Sincerely,

ADLAI E. STEVENSON,
Chairman,
Subcommittee on Science, Technology, and Space.

UNITED TECHNOLOGIES,
Hartford, Conn., June 30, 1980.

Hon. ADLAI E. STEVENSON,
Chairman, Subcommittee on Science, Technology, and Space, U.S. Senate, Washington, D.C.

DEAR SENATOR STEVENSON: I am in receipt of your letter of June 17 regarding the proposed "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies."

First, I would like to correct an apparent misunderstanding regarding my position in 1972–73. I was clearly not in a position of approving policy issues. While this certainly was an area where I had some personal concerns, I had neither the responsibility nor the authority for the approval of policy issues of this kind.

I do not feel it would serve any purpose to review my personal concerns during the early Seventies. However, we have recently taken a position on this matter as outlined in my June 4, 1980, letter to the Hon. Roberts B. Owen, legal advisor to the Department of State. A copy of that letter is enclosed.

I hope the above background information is of some help in clarifying this issue.
Sincerely,

ALEXANDER M. HAIG, Jr.

Enclosure.

UNITED TECHNOLOGIES,
Hartford, Conn., June 4, 1980.

Hon. ROBERTS B. OWEN,
The Legal Adviser,
Department of State, Washington, D.C.

DEAR MR. OWEN: Many thanks for the opportunity to set forth United Technologies' views on the Moon Treaty. Because of our involvement in space technology, we have been following it closely.

In our view, the United States should refrain from signing and ratifying the treaty until a satisfactory "international regime," as provided in Article II, has been definitively negotiated. We do not believe it is in the national interest to endorse the treaty without knowing the precise form and function of the "international regime" which is to oversee and manage celestial resources and their exploitation.

Clearly, the common heritage concept expressed in the treaty underlies Third World efforts directed at a fundamental redistribution of global wealth. This has been amply established in the statements of foreign delegations and the provisions of negotiating documents in several international negotiations, notably the Third United Nations Conference on the Law of the Sea.

In advancing the concept of common heritage, Third World countries have indicated they intend to gain control of critical raw materials and to gain access as a matter of right to the technology needed to exploit them. Law of the Sea negotiating texts make plain that the common heritage international regime means rigid production controls, transfer of financial and technological resources, and decision-making essentially on the basis of one nation, one vote. These are inimical to private enterprise market principles and the interests of the western industrialized nations. Furthermore, the United States would be particularly injured, because it would be required to relinquish many of the advantages of its current technological leadership.

In the Moon Treaty and Law of the Sea texts, the pertinent language is identical for all practical purposes. Third World representatives have made it clear that, in each case, the intended result is the same. Concern about the similarities of the two treaty texts has been expressed by, among others, the Chairman and Ranking Minority Member of the Senate Foreign Relations Committee, the National Resources Law Section of the American Bar Association, the National Association of Manufacturers, the National Ocean Industries Association, and the Law of the Sea Committee of the American Branch of the International Law Association.

Like many in both the private and public sectors, we are concerned that the exploitation regime envisaged in the Moon Treaty will follow the Law of the Sea treaty regime relating to undersea resources.

U.S. mining interests have asserted that their ability to exploit strategic seabed minerals, such as cobalt and manganese, is seriously jeopardized by the draft treaty's provisions on resource and access and technology transfer. Deep ocean mining consortia have warned that they cannot make the investments necessary for seabed mining because they could not operate profitably under the regime envisaged by the Law of the Sea Treaty.

Similarly, United Technologies does not believe the aerospace industry could undertake the development of space resources under a similar system applied by the Moon Treaty. Nor are we satisfied that unilateral understandings attached to the Moon Treaty by the United States would protect America's interests. Such understandings as those proposed by the International Law Section of the American Bar Association only underscore the defects of the treaty.

From the standpoint of national security, a key consideration of the Moon Treaty is assured access to critical raw materials. The treaty text does not provide for assured access. Indeed, the treaty is likely to lead to an exploitation regime in which access to resources is subject to Third World control. In addition, we believe the mandatory transfer of technology to an International Authority would be harmful to the United States' security. In the Export Administration Act of 1979, Congress has clearly expressed its concern about the exporting of technology which could enhance the military potential of other countries to the detriment of our own security.

We believe a satisfactory international regime for the exploitation of celestial resources should be negotiated before the United States commits itself in international law to the common heritage and its implementing principles through signature and ratification of the Moon Treaty. Proceeding any sooner with signing and ratification is opposed by United Technologies, because it could doom any private investment directed at space resource exploitation.

We appreciate the opportunity to express our position.

Sincerely,

ALEXANDER M. HAIG, Jr.

U.S. SENATE,
Subcommittee on Science, Technology, and Space.
JULY 3, 1980.

Hon. GEORGE H. ALDRICH,
Department of State,
Main State Department Building, Washington, D.C.

DEAR MR. AMBASSADOR: The Subcommittee on Science, Technology, and Space has scheduled hearings on July 29 and 31, 1980, on the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies." This Agreement, endorsed and opened for signature by the United Nations last December, is of great importance to the United States with respect to the future use of extraterrestrial materials. It is a forward thrust in space law in an effort to keep the legal aspects of

space exploration and use current with the scientific and technological developments. Consequently, the Senate has a responsibility to examine closely this new space treaty to assess how its provisions would affect the use of the space environment, including the exploitation of extraterestrial resources, by the United States and other States.

The Agreement is being debated pro and con, and sometimes compared with the negotiating text of the Law of the Sea. A principal reason for this comparison is that both documents contain the phrase "common heritage of mankind." Negotiating Text/Revision 1. United Nations Third Conference on the Law of the Sea states, "The seabed and ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction (hereinafter referred to as the area), as well as the resources of the area, are the common heritage of mankind." The Agreement states (Article 11, paragraph 1): "The moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of this article." The purpose of the Subcommittee heaings is to obtain information on matters with which the Agreement deals for the purpose of making prudent decisions. Therefore, the Subcommittee would appreciate having a statement giving your views on the proposed Agreement, particularly with respect to the phrase "Common heritage of makind." We propose to publish that statement as part of the hearing record. As we are anxious to publish the hearing as soon as possible, it would be most appreciated if your statement could reach us by the middle of August.

Enclosed is a copy of a document prepared for the Committee to provide some background on the Agreement.

Sincerely,

ADLAI E. STEVENSON,
Chairman,

DEPARTMENT OF STATE,
Washington D.C., August 15, 1980.

HON. ADLAI E. STEVENSON,
U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: In response to your request of July 3, I am pleased to submit my views on the phrase, "common heritage of mankind" which is found both in the Moon Treaty and in the draft Law of the Sea Convention. I would not wish to comment on the Moon Treaty generally, on which I understand the Legal Adviser of the Department of State has testified on behalf of the Department.

To me, the phrase, "common heritage of mankind" is simply a device for conveying the idea that the resources to which it is applied are situated outside the jurisdiction of any nation, are not subject to having national sovereignty extended over them (although, once recovered, they are subject to ownership like any other mineral, and should be exploited for the benefit of all. The phrase recognizes that the colonial era has ended and that dividing up these remaining common areas of the world among nations, as the Western Hemishpere and Africa were divided up in earlier centuries, is not a viable option today. Although some have asserted that certain developments in the U.N. Conference on the Law of the Sea have given further meaning to the phrase, "common heritage," I do not agree. There are many ways in which the resources of the world's commons could be exploited consistent with the idea of the common heritage, and the parallel system of the current Law of the Sea Texts with the provision of funds and technology for a new international seabed mining "enterprise" is merely one of them. The nature of any exploitation regime for common resources must be determined by the interested states when the time comes to exploit that resource.

Enclosed is a fuller statement of my views on this question in the form of remarks delivered to the Oceans Policy Forum on December 6, 1979, which was arranged by the Center for Oceans Law and Policy, University of Virginia.

Sincerely yours,

GEORGE H. ALDRICH.

Enclosure.

A FEW THOUGHTS ON THE CONCEPT OF THE "COMMON HERITAGE OF MANKIND"

The phrase "the common heritage of mankind" has been with us for a number of years. It has long been used to describe the resources of the deep seabeds beyond national jurisdiction in the Third United Nations Conference on the Law of the Sea, and it has recently appeared to describe the resources of outer space in the Moon

66-705 O - 80 - 15

Treaty, as adopted by the United Nations General Assembly in December 1979. In neither context is its meaning clear, but anxiety about its possible implications has been expressed, in particular about the possible implication that these resources are legally unrecoverable unless and until universal agreement is reached on a regime for their exploitation. Doubtless there are many states that would like such an implication, just as the United States is opposed to such an implication. So long as the argument is about the term itself, no one who is committed to one view or the other is likely to be persuaded to change unless his perceived interests change. However, if we look behind the term to the real problems facing the world, for which the term is merely a symbol, some more meaningful conclusions may be possible.

The real problem we face is the use to be made of commons of the world—that is those areas beyond the jurisdiction of any state which are available for the use of all. Given the fact that our present world order is built upon the nation state, it is not surprising that there are uncertainties and problems about the use of common areas not subject to the jurisdiction of any state. Moreover, these common areas are not unimportant, and it is predictable that their importance will continue to increase in the years ahead. These commons are: first, the oceans, including the bottom of the oceans, that is the seabeds, beyond the limit of national jurisdiction; second, outer space, above the limits of national jurisdiction (wherever that may be); and third, Antarctica, although one must note that some states have still preserved their territorial claims to parts of Antarctica under the Antarctic Treaty regime which has made it possible to continue scientific activity in Antarctica without resolving disputes over the legal status of that territory.

There are, in my judgment, only two ways of treating these common areas for legal purposes. Either we can consider them available for national appropriation, like North and South America in the Fifteenth to Eighteenth Centuries, and Africa in the Nineteenth Century, or we must consider them not available for national appropriation, like the high seas since at least the days of Hugo Grotius.

The United States, along with virtually all other states, has given consistent support to the second of these legal approaches during all the years since the end of the Second World War. We have done this, it is fair to say, because we were convinced that this was the better approach in our own interests and in the interests of world order and the avoidance of unnecessary conflict. As previously noted, the only exception to this consistent approach has related to Antarctica, and there it is worth noting that the claimant states are by and large resting on old claims, not making new ones. It is perhaps also relevant that the Antarctic is the only one of these common areas involving land areas on the surface of the earth available for occupancy, and thus is most likely to tempt states to apply the old colonial doctrines which were applicable to other areas of land. Even in this case, however, the most interested states have managed to accept and utilize a unique legal regime, the Antarctic Treaty, which makes each other's positions on territorial claims largely irrelevant to their activities in the Antarctic.

Difficulties in the use of the world's commons arise when some states want to exploit some of the resources of these common areas. There has been exploitation of the living resources of the high seas for many years without major difficulty, although it has been found necessary to create a number of international organizations to coordinate conservation efforts, the protection of marine mammals, etc. Significant problems, however, arise wherever exclusivity of access to a particular site becomes necessary. By definition, an area beyond national jurisdiction is one to which no national authority can accord such exclusive rights. With respect to the resources of the seabeds, although some commentors have argued that they should be available, like fish, to all states on a first come, first served basis, it seems generally accepted that economic and commercial considerations would probably force the deferral of mining activities in these areas until exclusive access to particular sites could be accorded. Although the use of outer space has not yet reached the point where exclusivity of access is important, it is conceivable that such a need might arise in the future. I think it is self-evident that where exclusivity of access is essential, it can only be conferred by agreement.

Most objections that have been made to the concept of the common heritage appear to arise from the belief that, quite apart from these economic and commercial pressures, this concept implies a legal moratorium on exploitation of resources until an international regime is established. certainly, it is true that, if there were such a legal moratorium, it would distort the negotiating leverage of the states trying to establish a regime for exploitation of resources, probably prolong and render more difficult the course of negotiations, and tend to produce results that were unsatisfactory or even unacceptable. But the question is whether that implication of a legal moratorium is in fact inherent in the concept of the common heritage

or in the underlying problem of the use of these common areas of the world. In my view, there is no such implication flowing either from the reality or from the phrase, but it is clear that we need to dispel misconceptions on this score.

I would suggest that there are certain inherent limitations in the use of the commons and the concept of the common heritage. First, the resources of these areas must be available to all and are not subject to national appropriation in the sense of acquisition of sovereignty or title to all or part of the area. Second, exploitation of these common areas should be for the benefit of all, although whether this implies a requirement for the sharing of revenues is a debatable question. Third, the use of these areas should normally be preceded by good faith negotiations aimed at creating an agreed legal regime prior to any unilateral action for their exploitation. This is what has happened in the law of the sea; it is beginning to happen with respect to Antarctica; and it will probably happen some day with respect to outer space. But I see no other necessary implications flowing from the nature of these areas as commons beyond national jurisdiction or from the concept of the common heritage, which is often used to describe them.

Naturally, those who see no need to exploit these common resources within the foreseeable future will be tempted to argue that their nature is such that there is a prohibition of exploitation until such time as an agreed regime is in place. With respect to the seabed resources, this position was taken in 1969 by a majority of members of the United Nations General Assembly, and this majority has, in the years since, tried to bolster its arguments with resolutions in other bodies, such as UNCTAD, and through repetitious legal argumentation. On the other hand, those who think that they may want to exploit these common resources in the foreseeable future disagree with these arguments and try to preserve their legal right to carry out such exploitation if an agreement on the regime cannot be reached.

The differences are understandable. They are explained in terms of the effect of the two positions on the negotiating leverage for the legal regime itself. They flow from real differences in interests, differences between states who have need for these resources today or in the near future, and states that do not have such a need, but perhaps foresee distant future uses of the resources. And, these differences flow from ideological reasons. In general, developing countries believe that the developed, largely Western, world has despoiled natural resources and should be restrained in its future uses of them, in addition to owing developing countries damages for their past mistreatment. The developed countries, on the other hand, believe that artificial barriers should not be placed in the way of utilization of natural resources, that the growth of the world economy and the general prosperity depend upon access to resources by those who need them, and that legal restraints cannot be imposed upon states without their consent.

Looking at the current negotiations in the Third United Nations Conference on the Law of the Sea aimed at creating a new international regime for the exploitation of the deep seabeds, I would suggest that the Government of the United States, and the governments of other countries concerned about the availability of raw materials that may come from seabeds, must inevitably reach conclusions along the following lines:

First, we cannot accept the views pressed by many of the developing countries on the legal nature of the restraints on our access to seabed resources. To do so would, in the context of this conference, skewer much too far the negotiating leverage against us. More broadly, it would create a dangerous precedent for the imposition of new restrictions to which we have not assented on our rights of action in areas beyond national jurisdiction.

Second, we can and we should do all that is possible to develop through the Conference an acceptable agreement on a new regime for the exploitation of seabed resources. Quite apart from the value we may place on the other, non-seabeds parts of the Law of the Sea Treaty, we need an agreed regime if we can possibly reach one in our own interest of access to seabed resources. A favorable climate for investment is unlikely in the absence of security of tenure and broad agreement on a workable regime. Moreover, if agreement proves in the end unobtainable, and the United States and the other most concerned countries are thus forced to act on their own, it will be both politically and legally important to have a clear record that we have made every reasonable effort to achieve agreement and that failure is not our fault.

Third, if and when our needs for seabed mineral resources become urgent, we can and we should ensure that the resources will be available, whether or not the Third United Nations Conference on the Law of the Sea is successful. We should do so consistent with the common heritage principle, that is providing benefits for all through increased world production of needed minerals and perhaps through some sharing of revenues, and by demonstrating our continued willingness to negotiate a

reasonable international regime for these resources to supplant any interim one that we are forced to create. If anyone doubts that states would, and in fact must, be prepared to take necessary action to obtain urgently needed resources, I would ask them to consider what would be the likely position of the oil importing countries of the world if the minerals at stake in the deep seabeds were hydorcarbons instead of nickel, copper, cobalt, and manganese. Does anyone really believe that the absence of a universally agreed international regime would long delay exploitation of such hydrocarbon resources?

Fourth, the difficulties facing the seabeds negotiations are formidable, but not insuperable, if we remain determined to negotiate for an acceptable regime, and show patience and willingness to stay at this negotiation as long as it takes. The problems we face are extraordinarily difficult, in part for reasons inherent in the complexities of creating the first international regime for the exploitation of the resources of one of the commons of the world. Moreover, if it were not clear that we had important security benefits in the navigational provisions of the treaty, or if we had not been compelled to legitimize 200-mile fishery zones while the treaty negotiations were in process, or if we had a demonstrably more pressing need for access now to the seabed minerals in question, the negotiations would be much easier. Nonetheless, we have no choice but to accept the facts as they are and to continue to negotiate for an acceptable regime, which means a regime under which we shall have assured access to seabed minerals under reasonable terms and conditions. Although we are approaching the crunch in these negotiations, and all of the 150 participating states are anxious to bring the negotiations to a successful conclusion during 1980, the United States must make clear that our minimum requirements must be met and that we cannot be pressed by deadlines into accepting a result that does not give us the assured access we require.

THE UNIVERSITY OF SANTA CLARA,
DEPARTMENT OF ELECTRICAL ENGINEERING
AND COMPUTER SCIENCE,
July 24, 1980.

Hon. ADLAI E. STEVENSON,
Chairman, Subcommittee on Science, Technology and Space,
U.S. Senate, Washington, D.C.

DEAR SENATOR STEVENSON: The opportunity is welcomed to provide my views and questions on the "Agreement Government the Activities of States on the Moon and Other Celestial Bodies." Enclosed with this letter is an analysis appropriate for publication. In brief I believe the "Moon Treaty" should be used to promote a full and deep nationwide debate on the potentials and problems of this country's expansion permanently into space. Until this debate has occurred, I believe any action on the treaty would be taken in virtual total ignorance of the greater realities afforded by our expansion into space.

I have directed approximately 5 work years of NASA sponsored research on the feasibility of processing lunar materials into forms for manufacturing of a wide range of products. Over 1,500 pages of original documentation has been produced and well over 200 professionals from a wide range of technical disciplines have been involved.

We posses extensive knowledge of lunar materials and operating conditions on the moon and cis-lunar space. This knowledge is adequate to permit the definition of lunar utilization programs which could form the basis of significant space industries in this century.

I have also pursued the private development of proprietary concepts for solar energy and space transportation systems which incorporate lunar materials to great advantage. Extensive, and well received, presentations have been made to major committees and workshops of NASA, DOE/National Academy of Sciences and the Department of Defense. These private presentations have detailed: (1) how to economically establish multi-thousand gigawatt solar power stations on the moon (the US uses 550 gigawatts-electric) to supply energy to earth and space users; (2) how to virtually eliminate the need for propellants for high-tonnage and low-cost travel between low earth orbit and the moon and outward from the moon; and (3) how to sharply decrease the cost of earth to earth-orbit transportation by the use of lunar materials, Dr. Frosch is aware of these concepts. I would be happy to present them to your staff in private.

Any opportunity to provide your forward looking committee with technical information or analyses will be welcome.

Cordially yours,

DR. DAVID R. CRISWELL.

Enclosure.

REVIEW OF: AGREEMENT GOVERNING THE ACTIVITIES OF STATES ON THE MOON AND OTHER CELESTIAL BODIES (COMMITTEE PRINT MAY 1980)

INTRODUCTION

Several comments should be made concerning the manner in which this review of the Moon Treaty (MT) is presented. Rather than analysing each section by itself the first 97 pages of the COMMITTEE PAPER were reviewed. Notes were made on a paragraph by paragraph basis of comments or considerations of interest to the reviewer. These considerations were then collected into major categories (for example—BOUNDARIES). The topics under each major category are then discussed. Page numbers of the source of the topic are indicated in parentheses (nn). The material from page 97 onward was used as reference materials. No comments are presented relating that material to the main subjects of the "MOON TREATY." This approach forced the reviewer to look beyond the formal structure and wording of the treaty and attempt to understand a few of the possible implications of the treaty in situations which he can envision.

PEOPLE AND SPACE

The extension of humanity into space offers the first opportunity in over 10,000 years for a reversal of the consolidation of people into larger and larger coordinated groups. This is true because present trends of technology can be expected to eventually produce machine systems which can create new wealth from sunlight and the common minerals of the solar system. These systems will be able to create growing human communities in space. Very likely operation of these advanced technologies will not require large numbers of people. Therefore, the enormous volumes of space and materials and flows of energy in our solar system could support the extensive growth of a wide range of new societies.

The proposed moon treaty defines the opportunities in space in terms of States Parties (87). It makes no generative reference to the people which support States Parties. There is no explicit accommodations in the Moon Treaty for those who might like to move in different directions (9, 11, 20, 57). The dominant mention of States Parties of courses reflects the fact that the UN is composed of member states. However, I perceive that one of the many tacit assumptions underlying this proposed treaty is that space ventures will always be extremely large undertakings requiring national support. This does not have to be the case as the various tools of mankind continue to improve and major staging facilities in space and on the moon come into being.

The question of Civil Jurisprudance versus International Public Law (28, 88) and which should apply takes on a new dimension when the possibility of rapid growth in space of small groups is taken into account. This is especially true if some of the groups decide to renounce national connections and form new local governing systems. It is very likely that a new hierarchy of appropriate laws and legal systems will be required. The laws must evolve for the protection of terrestrially directed countries and organizations and for the inhabitants of newly formed and growing abodes in space and on other celestial bodies. It is clear that private, national and transnational developments in space will be affected, possibly slowed, if some mechanism(s) is not provided for assuring participants of secure opportunities to develop in space.

A commitment to provide shelter (11, 91) on the moon to ASTRONAUTS in distress is a vital provision and one which promotes human concern. The term Astronaut may become extremely colloquial (56).

The questions of protecting the Earth from activities in space will come into increasing prominance in the years ahead (20, 89). Some possibilities are obvious such as the dangers inherent in deliberately bringing asteroids closer to the earth for utilization. Others will be far more subtle. For instance, perhaps a biological processing procedure will be evolved and used in space to the benefit of all. However, the process may require the use of extremely pathogenic materials at one stage. What controls can be placed on the use and development of such materials? What types of inspections will be necessary to insure their proper use (94)? What controls will be required to monitor for harmful mutations?

TIME SCALES

Language in the treaty and reported in the debates on the treaty indicate that a considerable period of time is anticipated before the first conference is required on the exploitation of space (64, 57, 78, 95). There are good reasons to think that this

need not be the case. It is not inconceivable to this reviewer that the first "RESOURCES" conference might have to be held between 1985 and 1988. Such a conference might have to deal with uses of major portions of the lunar surface and the allocation of key operations areas on the moon. By the late 1980's and the early 1990's it may well be possible to conduct massive engineering operations on the moon and in cis-lunar space. The use of lunar materials can be the key to construction on the moon and low cost space flight.

In a period of very rapid development of facilities, production and planning the need to exercise a one year withdrawal option might create awkward discontinuities in developments. In addition, the need to withdraw and the steps necessary might inhibit the development of clear plans to make maximum use of space as new opportunities come into realization (24, 65, 96). In any event withdrawal from the treaty is a clear signal of changing motivations and could weaken the U.S. role in the UN at a critical time.

Development of routine missions between the earth and the moon and about other celestial bodies may require the development of a suitable routine reporting arrangement. It may well be that proprietary developments might be infringed or interferred with if too extensive a reporting procedure is required (89).

A question of considerable importance is the time after which a facility, area or volume on the moon is considered no longer in use (89, 90). Must the States Party declare the region no longer in use at the annual review (19, 91)? How will it be decided what are separate facilities? It is reasonable that the only links between some of the facilities will be provided by radio or lasar. Possibly facilities are coordinated only through very precise clocks with no contact following the original set-up of the facilities.

Will there be a time or period of apparent non-use in which a second party can simply walk (fly?) in and take over the territory, volume or trajectory without announcement? Will a convention such as squatter's rights apply after a 7 year period of unchallenged occupancy?

BOUNDARIES AND ACCESS

The fundamental difference between the Moon Treaty context and that of the Law of the Sea (8) is one of geometry. Space is outward from every country whereas access to the sea is over a two dimensional surface. It might be a useful exercise to read the old (1880's) short book "Flatland" as an aid in gaining insight of the fundamental differences which may arise when one moves to higher dimensions. Major boundaries mentioned in the treaty are those around the earth (orbits about earth), around the moon (orbits about the moon), surfaces and volumes on the moon (11, 18, 19, 22), about facilities (21, 22, 48), operations of a dynamic nature (17, 22), and regions which are knowledge related (13, 18). Very likely other boundaries will be defined. The largest boundary is that about the entire solar system—the volume to which the entire treaty applies.

We note first that the treaty will apply to a volume of space which is not only immense but which totally envelopes the earth (87, 88). The International Regime (92) will eventually become a meaningful authority over the natural resources of everything else in the solar system which is outward from the earth (30). This is, if not the first, at least the most dramatic example that a fundamentally new era of government by humans is approaching. Is it really appropriate for the United States to create such a transnational entity before gaining experience in major off-earth operations? What will be the restrictions, if any, on nations whch refuse to sign the treaty (50)?

There are practical problems in defining some of the boundaries. Near the outer limits of the gravitational influence of the earth or the moon there are many orbits which can be changed from one focus to the other very easily. In some regions the indentity of the controlling body is not clear (88). For example L4 and L5 are motion-confining volumes of space created by the mutual actions of the moon, earth and sun. Will comets on hyperbolic orbits be considered part of the solar system? Is there anything in the proposed treaty which guarantees that the negotiating systems which will be set up can decide these matters in a fair and scientific manner? The only guarantee which is apparent is the option for the participants to walk out. Is material which is artificially directed toward earth but otherwise reaches earth without further interference considered to "reach the surface by natural means" (88)?

Very likely many orbits and trajectories about the moon and other celestial bodies (88) will be used which have some intrinsic value in themselves in the same manner that geosynchronous orbit is now realized to be especially valuable. This is very likely for the moon because the same side of the moon always faces the earth and the equator of the moon is tilted only slightly from the plane of the orbits of most of

the mass of the planets. This means that high utilization of some trajectories can be expected, Therefore, interference between users can be expected and simple deferral of operations may not be possible (89). For example, passive packages of soil thrown off the moon to the L2 point behind the moon will follow essentially the same trajectories. It is not clear at this time that there are more than a few small areas on the moon and volumes of space behind the moon appropriate for these types of launch and gathering operations. There may be major reasons for conflicts with respect to these dynamic simultaneous operations (17, 90, 91).

Boundaries on the moon around installations present definite problems. It is clear from the treaty that the framers envisioned small installations (perhaps somewhat like those in the Antarctic or at the Apollo sites). These installations would present only nominal blocks to surface transportation and be relatively easy to inspect without disturbance (19, 22, 48, 60–3, 62, 90, 91). However, it is quite possible that major facilities may be constructed which densely cover large fractions of the lunar surface and which should not be penetrated for fear of significantly disturbing their operations. Need for these facilities might exist for hundreds of years. How does this requirement balance with the notions of no property (13, 92, 93) and unlimited access? It may well be that there will be major conflicts between the exploitive use of lunar real estate and the perceived need for scientific preserves (18, 90). It might well be that the UN sponsored group which decides what areas of the moon will be preserved for scientific use can in fact decide the fate of very basic exploitive options. The manner in which such preserves will be designated is not defined at all.

Penetrating facilities boundaries whether due to emergencies (93, 21) or inspection for hazardous materials or operations (13, 18, 56–6, 48, 22, 95, 62) may well result in the penetration of intellectual or proprietary information or processes. It is reasonable to expect that the invention and development of new materials processes and concepts relative to space manufacturing will be conducted at facilities on the moon and on other celestial bodies. Information proprietary to the long term commercial viability of some operations could be lost by inspections and the public release of information gained during such inspections. Thus, the right to inspection on demand could be a way of penetrating the patent and trade secret operations of organizations,. This produces a direct interface between U.S. patent law and the moon treaty. The dilemma is made explicit by the moon treaty requiring the prompt reporting of any scientific results (24, 89).

On the other hand it is very clear that facilities should be open for inspection for weapons, the health and well-being of all the inhabitants and related matters. It is suprising that there is no mention of the freedom of individual to leave a facility at their own volition or to have the freedom to communicate outward from the facility.

RESOURCES

Considerable debate was encountered in the discussion of natural resources. There was agreement that samples could be returned to earth and materials used locally to support a mission (11, 58, 90). There was an explicit denial of the concept of property to be applied to the native materials (92). There was no mention of ownership of the facilities and products produced from local materials and used locally or shipped elsewhere. This debate or argument might get extremely intricate if machines can be made completely out of local materials and then automatically make copies of themselves (perhaps even with extensive self-design as is now done with computers). These "native"machines could then upgrade the native materials into products of various kinds. Are the derived materials (upgraded) still native materials and not subject to ownership (20, 92)? Who "owns" the self-manufacture "native" machines?

It is to be expected that completely new means of processing available native materials into industrial goods will be developed which require only solar energy as the primary consumable. If this is so then vast new wealth can be created in the solar system and significant fractions of the wealth can benefit earth. However, there is a pressing need to realize in any treaty or arrangement for future space activities that the knowledge or skill required to do this is just as important as the raw materials. It is also necessary to explicitly allow for the concept of transfer-of-values. If this is not done then perhaps facilities will be occupied simply to hold onto real estate and no means or value exchange will be possible (92). It may be far more valuable for the United States to support the creation of a means whereby "new value" which could be created by Unites States organizations can be sold and traded fairly on an open market to all interested parties. It is not at all clear that the moon treaty as presently formulated will likely result in an internatinoal regime supportive of our economic development in space in an expedient manner.

Without a moon treaty we would have a major incentive to grow in space as quickly as possible. This might be the best approach for the United States and the World.

As previously mentioned, not all natural resources need be material. Momentum, angular momentum, stability, orbits, sunlight, access to the 3°K dark sky or to the magnetic field of Jupiter are all non-material items which may be of importance at some future time. We should think about these matters in far more detail (34, 42, 44, 47, 92).

It is explicitly stated that the natural environments of the various celestial bodies should be preserved (90). However, there is incentive to change the conditions of the major asteroids and possibly of various moons. Is the environment of an asteroid changed if it is made into a space power station? There are suggestions of how to change one or more of the planets (for example increase the temperature of Mars) to make them more habitable. Eliminating these possibilities without any further thought is not reasonable. In any event, the atmosphere of the moon is so low in mass that even the landing of one small chemical rocket can change its composition for months (53).

I would be very interested in knowing the full range of reasons why the delegates were ready to lay aside the moon treaty in late 1979. Is it possible that they actually felt the present document was not appropriate? Were they so far from imagining its implications that they did not have the mental energy for deeper consideration (38)? Why did the USSR become supportive of the treaty after long opposition?

PRODUCTS/TRANSFORMATIONS

A basic question is: Can there be ownership of the products produced from lunar materials and from materials of other celestial bodies (11, 79–8, 56–3) whether the products resided on the moon, in space, on other celestial bodies, on earth or some combination?

What distinction, if any is made in the ownership of delivered facilities versus those made from local materials in-whole or in-part (12)? When does the use of local materials go beyond mission support (18, 90) or scientific usage? We note that scientific usage might include the use of materials to develop new commercial processes. So there is a blurring of scientific usage in the "lunar sample research" meaning and in the industrial meaning (20, 28).

Some countries may sign the convention in order to inhibit the immediate expansion of space industrialization. The sentiment has already been expressed (27) by India. Is it wise to formally recognize a means of international organizational resistance to space exploitation this early in the game?

I note in passing that "soil" is not a good technical term to describe the granular materials found on the moon, Mars or expected on some of the asteroids (27).

Although no examples will be given here it is reasonable to expect that non-material services and non-localized systems will be developed which utilize the moon and/or other celestial bodies (80–11). Will those new services and systems be considered natural resources?

BENEFITS

The most fundamental product or benefit of the use of extraterrestrial materials may well be the demonstration that given sunlight, common minerals and the appropriate skills the full range of products and services of advanced civilizations can be made available to all who utilize their own skills to create in a manner which detracts from no person or group. The quicker this demonstration comes to pass the better off the people of the world will be. Such a demonstration on the moon or also in low earth orbit would be especially dramatic (87, 92, 78–3).

With free access to space and equal access to materials does the moon treaty offer a way for commercial groups to go above terrestrial trade restrictions and customs at national boundaries (15)?

The distribution of benefits is simply the inverse side of the means by which new value created in space can be traded or exchanged (92–7d). Deferring this issue to later discussions seems very dangerous and not an especially creative use of the period of new opportunity for humanity. Thus the debates of up-front versus post-payoff investments and the possible generative roles the proposed internation regime (91) could plan should receive extensive and imaginative debate of a wide spread nature and not be limited to the stamina and timelines of the UN working group (25, 30, 31).

We note in passing that the benefits to be derived from operations on the moon might be extremely massive and occur at a significant level in this century. One should not necessarily consider major economic returns as distant possibilities.

Unexpected benefits or options might occur over very long periods of time. For example, the moon is presently moving away from the earth at the rate of 1 cm/

year and will eventually escape. Industrial ejection of mass could slow the recession rate and keep the moon in orbit about the earth (75).

It would be very instructive to hear a debate or extensive consideration on what the disadvantages are or could be to the non-space-faring nations of signing the proposed moon treaty. At least this would provide a good counter point to the debate of U.S. interests (80–16, 80–14).

Space industrialization provides an immense opportunity to demonstrate the ability of science and technology to solve the basic physical problems of supporting human life and creating prosperous conditions in a completely new context. The attraction of this to the rest of the world should be immense and direct outward the thoughts and goals of all. If a treaty is signed it should directly expedite this development in an explicit manner.

CONTROLS

The moon treaty appears to give the International Regime (IR) many opportunities to gain meaningful control over the development of the human race in the solar system (92–5). Some of this control can derive from the manner or timing of the release of natural resources (30), whether they be material or orbits (31, 42, 43) or even in the definition of what is the central body of an orbit (43). Presumably a cash or value flow might be established for the IR by the selling or releasing on a non-discriminating basis to whatever group had the resources at the right time to use and develop the natural resources (31). The IR might also be able to define terms such as "emergency," "interface," "free access" or "installation" in such ways as to control or strongly influence the development and use of resources in the solar system.

At some point in the future would the IR become involved in deciding where civil versus international law is applicable of even formulate the law of the solar system (88)? How long could the earth or even the small nations of the earth (US, USSR, GERMANY, etc.) stay apart from such an enveloping law if it were to be formulated (28)? Will there be a time at which the IR will do more than simply listen and recommend and transfer information (27, 94–2)?

The treaty explicity opens the opportunities for limited moritoriums on the development or resources by declaring areas scientific preserves (38, 54, 90–3). The IR can apparently define the conditions and times at which other celestial bodies can be accessed and developed (46, 47). Moderate sized asteroids contain as much material as is used world wide in a decade. Thus, this decision ability could develop real clout.

How will the IR deal with non-signatories to the treaty (50)? Can force be used if flagrant violations to the treaty occur by "foreign flags?" Who decides if force should be used, the Secretary General or a committee? Will the IR be structured in such a way that very long time delays are inherent in any request for the use of non-terrestrial materials? How could such delays be prevented? What difficulties are generated by the five separate space treaties in effect at this time and with different sets of signatories to each treaty?

It should be noted that a very real set of tensions can be generated on a semantic level by considering the alternative words to those in section 11—(page 96).

1. orderly and safe vs. unexpected, scintillating and chancy (not necessarily unsafe)

2. rational vs. see if it works (terrestrial intuition will not be a clear guide to what is best in space)

3. expansion of opportunities and exploitation vs. what are the limits to growth in the solar system?

4. equitable benefit sharing vs. risk taking, learning new behaviors to participate successfully

CONFLICTS

There are very real possibilities for major conflicts as the major powers all gain equal access to the resources of space. The mechanisms for conflict resolution seem no more effective in the space context than those of the UN on the ground (22, 90–2). Does the treaty allow for the defensive use of materials (48). This will be an issue of great military importance to this country before the decade is out.

There is no meaningful discussion of the development of systems for handling international disputes that involve commerical operations either by private, public or government organizations. In the early years of space industry there may be very complex organizations on all three of these levels.

DEFINITIONS

The International Regime may gain or lose considerable power by its ability to formulate definitions to key words. Words which seem of special relevance in the years ahead include: Other celestial bodies, interference, emergency, peaceful uses (include defense?), weapons of mass destruction, use—same as—exploitation, alienated materials (74), reasonable—with respect to—reporting on missions.

SUMMARY

The proposed moon treaty could impact the development of the United States and the rest of the world as humanity spreads throughout the solar system. The earth will gradually become embedded in a far larger complex of human and machine activities. There is a clear need for knowledgeable and fair development of this new realm. Much more thought can be profitably expended and far more debate and consideration exposed on a national and international level. All the questions raised in page 78–80 of the Issues section should receive considerable thought regardless of the fate of this particular treaty. A nationally supported program to understand the potentials and problems of the coming age in space is urgently needed.

SPACE SYSTEMS LABORATORY,
MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
Cambridge, Mass., July 31, 1980.

HON. ADLAI E. STEVENSON,
Chairman, Subcommittee on Science, Technology and Space, Committee on Commerce, Science and Transportation, U.S. Senate, Washington, D.C.

DEAR SENATOR STEVENSON: In response to your letter of 3 July 1980, I enclose my written statement on the Moon Treaty, for the record of the hearings by your Subcommittee. Thank you very much for your attention to the future of space industrialization, and for the opportunity to contribute to your process of decision.

Also in response to your letter, I should point out that M.I.T. did not do a study on the Moon Treaty. In recent years, the M.I.T. Space Systems Laboratory has performed a number of studies on space industrialization, including some on the use of non-terrestrial resources. Specifically between June 1978 and September 1979, this Laboratory (part of the M.I.T. Department of Aeronautics and Astronautics) studied space manufacturing under a contract to the NASA Marshall Space Flight Center. This research included the design of a space factory to convert lunar materials into components of satellites (such as solor satellites, service platforms, space stations, and spacecraft). This study was one of a trio of complementary studies contacted by NASA; the General Dynamics Convair Division and the Lunar and Planetary Institute performed the other two. I had the priviledge to be the Study Manager for the M.I.T. study.

Please call on me for any further help which I can give you. I look forward to any exchanges I may have with the Congress, on any space related issues.

Very truly yours,

DAVID B. S. SMITH,
Research Assistant.

Enclosure.

In March 1980 I attended a workshop held by the Office of Technology Assessment, to review a draft assessment of the Moon Treaty. Since this workshop I have had several exchanges of correspondence with the OTA on some of the technological issues in nonterrestrial resources. As I understand it, the final version of this assessment is part of the record of these hearings. In my opinion, the technological aspects of nonterrestrial resources are very well summarized in this document, and I cannot improve on their presentation in this writing. I would like to express my appreciation to Mr. Stephen E. Doyle of OTA, for his dedication in the pursuit of the available facts, and for his attention to detail in their description.

A more general aspect of this treaty which I would like to mention is the timeline of nonterrestrial resource use. In my opinion, the exploitation of nonterrestrial materials on a large scale, from the technical standpoint, can happen in fifteen years. If I am correct, then some significant decisions on research and development may have to be made by government and industry within ten years. In other words, I do not believe that nonterrestrial resource use is a twenty-first century issue—I think it is a current one.

Therefore I believe that it is important for the U.S. Government to establish clear and stable guidelines for itself and for industry, either through treaty of through unilateral action. By whatever method, we need a well-defined, well-understood

backdrop of legislation for the required long-led advance planning and capital venture.

As a final comment, in my opinion the underlying problem in nonterrestrial exploitation is not limited resources. As far as we know, the solar system holds enough resources to allow each and every country on earth to pursue any project it wishes to undertake. Rather, the problem is one of limited access to those resources, due to the limitations of our current technology. As mankind's ability to reach and use these resources improves, this constraint will fade away, and the world may then find that non-interference treaties will be sufficient to regulate nonterrestrial endeavors.

SPACE FUTURES SOCIETY,
Philadelphia, Pa., July 30, 1980.

Hon. ADLAI E. STEVENSON,
Chairman, Senate Subcommittee on Science, Technology and Space,
Washington, D.C.

DEAR SENATOR STEVENSON: The Space Futures Society wishes to thank you for your invitation to submit written testimony for your committee's hearings on the United Nations "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies."

Our position on this issue is enclosed and we sincerely hope that these views will prove useful in forming the conclusions drawn by the committee. We shall, of course, be available to answer all questions which you or members of your committee may have.

I believe that our position may cast a different light on the issue and hope that our views are considered in the formation of your decision regarding the "Moon Treaty."

Once again, thank you for the privilege of offering this testimony. The members of the Space Futures Society and I are at your service.

Sincerely,

MICHAEL CALABRESE,
Director, Public Information.

Enclosure.

STATEMENT OF THE SPACE FUTURES SOCIETY

Mr. Chairman, the Space Futures Society is a nonprofit organization dedicated to the industrialization and eventual humanization of space. We are a charter member of the L–5 Society national organization.

We are very concerned about the United Nations "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies" also known as the "Moon Treaty". We feel that the treaty, as it now exists, operates against the best interests of the United States in several aspects and question the way in which the Carter Administration handled its negotiation.

Much has been said concerning the treaty, both pro and con. One point which has been made clear, is that no agency or office of our government has a definitive understanding of this treaty, its impact or the meaning of its terms.

The defenders of this agreement seems to have taken the position that space means nothing to this nation, that its development can mean nothing for at least the next 50 years. This view is simply wrong, a false interpretation of the direction in which science is moving and shows a lack of understanding of the use of technology and its importance to the American and Western economies.

Technology is the resource of twentieth century America, just as the river system and timber supply was to America as it existed in the 19th century. The development, use and sellability of technology is every bit as important to the economic and political survival of the United States as the fertility of our lands.

It is clear that if the United States is to survive in an age of ever increasing technological competition between the nations, we must retain control over the development and use of that technology.

Mr. Chairman, the Space Futures Society has studied the terms of the proposed treaty and it is our opinion that this document, as it now exists, has been designed specifically to thwart the development of an industrial base in space by the West and particularly, the United States. It places the United States in a weakened position within the international regime it proposes and removes from our hands the control over the economic destiny of our nation.

THE TREATY TERMS

There are several terms of the "Moon Treaty" which we find fault with. The first is the "Common Heritage" issue. While we support the idea that the benefits of space and the technology used to attain them should be provided to the people of the world, we do not believe that this means that all nations should be able to control the actions taken by states attempting to use these resources.

Although the phrase "Common Heritage" was first proposed by the United States in an attempt to guarantee the availability of resources to all states (including the Third World), many developing nations have chosen to redefine the term so that it now refers to prohibiting the industrial nations from gaining access to such resources. The term has become the slogan for a variety of Third World and Soviet efforts to forge a "New International Economic Order" that would redistribute the wealth of the developed countries to the underdeveloped nations of the world.

Despite the fact that no agreement has ever been signed referring to the "Common Heritage" of mankind, many Third World states already claim that the concept is an intrinsic principle of international law. In doing so they are attempting to create facts of international relations with the consent of the rest of the world.

Defenders of the treaty have often claimed that this interpretation of "Common Heritage" do not threaten U.S. interests. This claim is strictly a unilateral statement on the part of some members of our government and will hold no weight before the World Court or the international regime proposed by the treaty.

The treaty is designed as an obstacle to the development of private industry in space, mandating that all activity be under the controls of the U.N. member governments and thus tied to the decisions of the proposed regime.

The establishment of such a regime is, in itself a direct threat to the interests of the United States. The U.N. agreement provides for the establishment of "an international regime . . . to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible" (Article XI, Paragraph 5). Such an international regime to govern the seabed has been defined in the Law of the Sea Treaty and it has the power to restrict the operations of any mining company in any way, to tax any company and require it to "share" technology with the regimes own monopolistic mining company, to guarantee its own company half of the available mining sites, to determine who shall be allowed to buy minerals produced by any company and shut down all competitive companies twenty five years after the treaty has been signed.

The regime set up in the Law of the Sea Treaty is the direct pro-genitor of the regime proposed in the "Moon Treaty". At no time has any international organization been granted such powers. We see no reason to grant them now, and particularly not to the United Nations.

The question of the imposition of a moratorium on lunar development has been brought up frequently. Treaty opponents have stated that there is an implied moratorium within the terms of the treaty, its defenders disagree. In fact, there is evidence that such a moratorium is contained within the treaty terms. This is contained in a paragraph stating "all the activities with respect to the natural resources of the moon shall be carried out in a manner compatible with the purposes specified in paragraph 7 . . ." (Article XI Paragraph 8), which details the objectives of the international regime.

A similar paragraph in a 1970 seabed resolution was held to be sufficient justification for a U.N. imposed, universally binding moratorium on ocean mining, which is still in effect. Should this draft treaty be adopted, anyone interested in making use of nonterrestrial resources would have to deal with the threat of such a moratorium and a regime which could tax it, drive it out of business or give up the competitive edge they had developed by having to "share" their technology with the U.N. regime. Clearly, this represents a risk which no corporation or nation could afford to take, thus they create a moratorium on development by virtue of the condition for business which they set regardless of their power to impose such a moratorium directly.

Mr. Chairman, we have grave doubts about the formation of this international regime. We question the ability of the United Nations to administrate such power fairly and effectively and see the creation of this supra-national regime as a threat to the American right to self-determination and control of our economic future. The creation of this regime will in fact take this control out of our hands and place with an international body where the United States and its shrinking circle of allies are in the vast minority. The United Nations has been increasingly anti-West in its positions, particularly with regard to the United States. Factions such as the Group of 77 have risen in the General Assembly, where they exercise a power out of all proportion to their size or strength. They will surely seek to continue that power to

the regime. This in combination with the effort of the Soviet Union to gain favor with the Third World will place the United States in an untenable position.

Mr. Chairman, I ask that you remember that an increasing proportion of the American economy is linked to the development and sale of our technology and that space is the field where we have seen the most promising growth for its use.

There has been a great deal of speculation as to the form of the regime to be established as this depends on the outcome of future negotiation. The mere fact that we are asked to consent to be governed in space by a government whose form we do not know is in itself very disturbing; however it may be useful to speculate on some of the possibilities and their impacts.

The first system which may materialize might be one in which each nation would have an equal say in the development of space resources. This seems most likely as the treaty was written to facilitate the transfer of wealth and power from the industrialized west to the developing nations. Surely they will move to retain the power they are seeking in this first agreement. This will place the U.S. in a bad position. The Group of 77 would surely be able to use its strengths most effectively in this forum, making moves by the United States all but impossible. While the United States might be able to stop actions operating directly against our interests, we will not be able to initiate actions of our own without building a strong coalition of support within the proposed regime. This may involve individual trade and technology transfer agreements, which would certainly be outlawed by the regime, and thus complicate any matter under negotiation. The only outcome of such a system could be the thwarting of the brand of moral justice sought by the Third World states, bringing no benefits to the United States.

The question of possible veto privileges has been raised by several members of the government of their aids who support the treaty. They offer this, presumably as a means of defending the United States against the actions of the proposed regime which might be damaging to our interests. Nowhere in this draft is there a mention of such privilege and it seems unlikely that the Third World would agree to such a provision as it would, in effect thwart the purpose of the treaty from their point of view. The question may in fact be academic in this case. However, if such privileges were granted, the U.S. possession of a veto would not be the issue. If we enjoyed such a privilege, so would the Soviet Union and the other states either on the U.N. Security Council or those with productive space programs. We would thus, be creating a situation where a nation like the Soviet Union had a veto vote and a voice in decisions controling the development of the American economy. Granting such powers would be madness and unacceptable to the American people and the Congress.

THE U.N. AGREEMENT SERVES SOVIET INTERESTS

Mr. Chairman, we believe that the treaty as it presently exists, not only operates against the best interests of the United States, it serves the interests of the Soviet Union.

Ever since the publication of Lenin's writings before the 1917 revolution, it has been the strategy of the Soviet Union to separate the West from its energy and industrial material resources. During the past decade, the Soviet Union has invested, perhaps tens of billions of dollars in military installations, the use of surrogate troops and Russian arms in the Middleast-Horn of Africa region. This has been done in an effort to cut the West off from its industrial lifeline.

Space offers itself as an area of unprecedented industrial growth and a new source of energy. Its development is entirely dependent on the availability of non-terrestrial materials. This is particularly true for the construction of such facilities as the Solar Power Satellite (SPS) an innovation which could well destroy Soviet policy in the Middleast. The "Moon Treaty" insures the Soviet Union against losing its investment in hardware and strategy and guarantees them the dependence of the West on this region for the next 25-50 years. The "Moon Treaty" not only effects the political and economic situation in space, it effects us in this and other tactical situations in the present.

The Soviet Union needs the "Moon Treaty" perhaps more than has been mentioned so far in the debate over the agreement. Space Industrialization offers economic and social growth on a scale never before seen in the course of human events. The Soviet Union could never hope to compete with the U.S. should private industry be allowed to invest in space industrial development. We could solidify our economy, become the dominant economic power on this planet and provide ourselves with a virtually endless source of energy.

The "Moon Treaty" offers the Soviet Union a cheap means of protecting billions of dollars worth of investment, thwarts the development of an industrial base in space by restricting the profitability of products produced and allows the Soviet

Union to develop its own technology until it can compete on the world market in space goods or perhaps dominate it.

Should the industrial might of the United States be turned toward space, we might well produce the Soviet Union into the ground. Russia has an appreciation of space not commonly seen in the United States, their government reads the publications on our technic development and has the good sense to fear it.

HOW WAS SUCH A TREATY NEGOTIATED?

As far a we can tell, the treaty is the product of relatively lower level negotiation within the United Nations delegation. One point has come up constantly in our investigation of the treaty and the American participation in the negotiations. The federal government of the United States is almost totally ignorant of the value of space, its potential for development as an industrial base or its economic benefits. There is a basic lack of understanding in terms of just what the American ability in space is and what it means to this nation and the free world. It is this condition in the thinking of the American government that creates much of the benefits for the Soviet Union in this treaty. They must maintain the status quo if they are to compete with the United States economically and militarily (considering the massive military potential space holds).

Mr. Chairman, the way in which the Carter Administration handled the negotiation of this treaty is at best a disappointment. Not until the L–5 Society took issue with the treaty provisions did the Carter Administration even start to investigate the terms of this document. In late October 1979, the Space Futures Society started its work on the "Moon Treaty", lobbying members of the Senate and in some cases, members of the House of Representatives and contacting the various federal agencies which should have been advising the President. To our amazement and horror, we found that no economic impact studies had been undertaken and that the defense implications of this agreement had never been considered. In our investigation, the Space Futures Society contacted the National Security Council, NASA, the State Department, the Department of Defense and the economic division of the Central Intelligence Agency. None of these offices had established a position on the treaty, in fact we found ourselves in the discomforting position of having to explain what the treaty was in most cases.

Mr. Chairman, no studies had been done because none were requested. Yet the President had already indicated that he would sign the treaty, an action which would have largely bound the United States to the treaty even without ratification by the Senate (the U.N. does not operate according to the provision in our constitution).

In addition to this, President Carter had issued an Executive order stating that the treaty could not be considered a cause for action against the administration. This was probably a move to protect the Administration from restraint of trade suits which might have been brought against the Carter Administration by the aerospace corporations or private investors. We are puzzled by this action. If the treaty was so insignificant that no impact studies were necessary, then on what basis was this order issued. This action brings into question the basic integrity of the Carter Administration.

CONCLUSIONS

In considering the terms of the treaty, we must find that it does indeed operate against the best interests of the United States. This treaty must be sent back to the United Nations for renegotiation. It is simply a bad agreement and shows at best a serious deficiency in the abilities of our delegation at the United Nations and in the policy making levels of government.

Recent research by the aerospace industry the Department of Energy and the Space Studies Institute (Pres. Dr. Gerard K. O'Neill), has indicated that the age of space industrialization may be a good deal closer than our government may think. The report issued by the General Accounting office in January 1980 on material processing stated that lack of interest on the part of the President and the Congress was the main reason for the delays in the development of an active space program in the United States.

The Carter Administration is one which seems almost deliberately disinterested in space. The Administration has consistently, since taking office, relegated space industrialization to the realm of the science fiction writer, discounting it as an area for major economic development. The President, unfortunately holds the position that space is unimportant to this nation, that there is no constituency for space and that there are no benefits to be gained there. He is wrong.

The fact that this nation was on its way to being committed to this agreement without the briefest of studies is appalling. This shows not only an ignorance of space, but an ignorance of government and the world as it exists today.

Because of this, we ask you Mr. Chairman, to demand that this treaty be returned to the United Nations for renegotiations and that a commission of experts on space industrialization be formed to advise and inform the President. This commission should be formed by experts from industry, government agencies like NASA (hopefully those who favor the continuation of the space program), and members of public groups who have a vested personal interest in space industrialization and humanization. This commission should do a much more thorough job than the usual and unending army of tummy rubbing bureaucrats who helped to produce this ignorance in the first place.

The future of this nation is most definitely at stake in the negotiation of this treaty. The greatest care must be taken and we must begin to deal from a position of knowledge.

Mr. Chairman, the endorsement of the United Nations agreement by the President and its ratification by the Senate would mean the abdication of our right to self-determination and an abdication of our position in the world. It is unacceptable to the American people, to us and as United States Senators, it must be unacceptable to you.

THE UNIVERSITY OF MISSISSIPPI LAW CENTER,
University, Miss., July 24, 1980.

Hon. ADLAI E. STEVENSON,
Chairman Subcommittee on Science, Technology, and Space of the Senate Committee on Commerce, Science, and Transportation, U.S. Senate, Washington, D.C.

DEAR SENATOR STEVENSON: I am writing you in connection with the proposed Moon Agreement on which your Subcommittee is scheduled to hold hearings. I would appreciate it very much if you could have the following statement included in the record:

While I am in general agreement that certain understandings and declarations may be necessary and useful should the United States Senate give its advice and consent to the ratification of the proposed Moon Agreement, I would like to take issue with the position that Art. 11 of that agreement does not affect any change in present international law or in present United States international obligations.

Clearly, the Moon Agreement changes present international law when it declares that the "moon and its natural resources are the common heritage of mankind" which finds its expression in the provisions of the Moon Agreement and, in particular, in paragraph 5 of its Article 11. In that article the parties undertake a good faith obligation *"to establish an international regime"* to govern the exploitation of the natural resources of the Moon as soon as such exploitation is about to become feasible" (emphasis is added). They also agree on the main purposes of the international regime (Article 11, paragraph 7) which includes "an *equitable sharing* by all States Parties *in the benefits* derived from those resources, whereby the interests of the developing countries as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the moon shall be given special consideration" (emphasis added).

Thus the crux of the matter relates to "equitable sharing" and much concern could have been allayed, had the terms of this and the international regime been fully clarified, or alternatively, not mentioned at all.

In view of the above, I believe the Moon Agreement makes some important additions to, if not changes in, existing international law, meaning in particular the Outer Space Treaty of 1967. Unlike Article 11 of the Moon Agreement, that treaty spoke in general about the "province of all mankind" (Article I), and Article II of that treaty was understood by the Legal Subcommittee of UNCOPUOS to place no moratorium on the exploitation of natural resources of the moon and other celestial bodies. It is my belief that the Moon Agreement places no moratorium on the exploitation of such resources prior to the establishment of the international regime, but such exploitation will have to be in line with the commitments incorporated in the agreement pertaining to natural resources, including those in Articles 6 and 11.

In the hope that the above statement will be of some value to your Subcommittee, I remain with all good wishes.

Sincerely yours,

STEPHEN GOROVE,
Professor of Law.

DISTRICT FIVE ENERGY COMMITTEE OF B'NAI B'RITH,
Annapolis, Md., August 6, 1980.

Hon. ADLAI E. STEVENSON,
Chairman, Subcommittee on Science, Technology, and Space, Committee on Commerce, Science, and Transportation, Washington, D.C.

DEAR SENATOR STEVENSON: Thank you for the opportunity to present testimony from the District Five Energy Committee of B'nai B'rith for the 1980 hearings concerning the Agreement Governing the Activities of States on the Moon and other Celestrial Bodies. Enclosed is the testimony for publication in the records of the hearings.

Respectfully yours,

Dr. BRUCE FRIEDMAN,
Chairman.

Enclosure.

B'nai B'rith has analyzed the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies from a number of points of views. These points of view range from an examination of the needs of the United States of America and how the natural resources of the extra-terrestrial environment could be used to aid in satisfying these needs to consideration as to the feasibility of utilizing these resources in the near future. The needs of the less developed countries have also been studied. As the result of this analysis B'nai B'rith concludes that it is not in the best interests of the United States of America to become a party to this Agreement which Agreement is popularly known as the Moon Treaty. B'nia B'rith strongly and unequivocally states that the United States of America must not become signatory to this document.

The District Five Energy Committee of B'nai B'rith sincerely appreciates the opportunity to submit testimony to the United States Senate concerning the Agreement Governing the Activities of States on the Moon and other Celestial Bodies, an agreement which is more popularly known as the Moon Treaty (MT). District Five of B'nai B'rith comprises the states of Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, and Washington, D.C. The District Five Energy Committee of B'nai B'rith is the highest body within B'nai B'rith dedicated specifically to energy and space matters.

The MT is a product of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). This treaty is presently before the United Nations General Assembly (UNGA) for signature by member nations of the United Nations (UN).

To most of the people of the United States, the MT is basically a document of very little relevance to their everyday concerns. It has been almost a decade since the most recent visit to the moon by human beings. The mood of the nation is such that a good deal of thinking is being expended on the day to day problems confronting society which problems apparently have very little to do with the extra-terrestrial environment. Some Americans, however, for a long period of time from before, during, and after the missions of Project Apollo to the moon have seen more or less clearly that the utilization of the space beyond the earth will become increasingly more important to the prosperity, security, and very survival of the United States of America. It is among these Americans that a good deal of opposition to the MT has arisen. B'nai B'rith comprises one group that is opposed to the signing of the MT by the United States of America because B'nai B'rith believes strongly that the act of signature would be detrimental to the best interests of this nation.

In order to understand the position of B'nai B'rith and other organizations and people opposed to the signing of the MT, it is a matter of importance to understand the situation of the United States with respect to the natural resources available to it since the MT has as its basic goal the regulation of the utilization of such resources by the nations of the earth.

What is a "resource"? More particularly what is a "natural resource"? Consider the word "resource" by itself. This word has several meanings in the context of a discussion of the MT. A resource is something that is readily available for use or that can be utilized for aid in accomplishing some goal. It can be a supply of something that is used to satisfy or aids in satisfying some need. A resource can be something that an entity, such as a state or country, can make use of to its own advantage. It can also be a means of accomplishing something. Now consider the word "natural". The word "natural" refers to something that is produced or found existing in nature. Something is "natural" if it is not artificial or manufactured.[1]

[1] 1. "Webster's New World Dictionary of the American Language." College Edition. Cleveland and New York, The World Publishing Company, 1962.

A "natural resource" is then some actual or potential form of wealth provided by nature. It is also something found in nature that can be used to attain or aid in attaining some goal or some need. A "natural resource" can be something found in nature that a country or state can use to its own advantage.[1] Consequently, a natural resource could be the atmosphere of a planet, coal, petroleum, waterpower, solar energy, arable land, or even the gravitational field of a world, to give a few examples.

The United States is encountering natural resource difficulties. The most prominent natural resource difficulty is in the area of energy. The specific natural resource in this area is petroleum. This nation has become far too dependent on other countries for petroleum and those countries are taking advantage of this situation.

In the non-fuel minerals area this nation is also dependent on other countries. This situation does not yet receive headlines as does petroleum. The problem of minerals will become more serious as time goes by unless constructive actions are initiated now. The potential seriousness of the mineral situation has received and is currently receiving scrutiny by the federal government.

Nonfuel minerals are definitely one of the items covered by the phase "natural resources" in the MT. In order to put the B'nai B'rith assessment of the MT into proper perspective, the current review of the nonfuel minerals situation in the United States which is now being undertaken by the present presidential administration must be considered. This review is being carried out under the procedures set up by the Domestic Policy Review System. The Executive Office of the President established this system in order to have coordination of the work among Federal departments and agencies in the development of Administration policy on selected issues.[2a] [2b]

The conduction of this review is under the general direction of the Domestic Policy Staff (DPS) and the Policy Coordinating Committee (PCC). The PCC is a Cabinet-level organization. The chairman of the PCC is the Secretary of the Interior. The objectives of the PCC are the determination of the important problems having an effect upon nonfuel commodities and the recommendation of possible actions, if any, which the federal government could take to handle these problems. The nine problem areas covered by this review are the (1) major minerals supply difficulties; (2) accessibility of foreign minerals to the United States and its allies; (3) relationship between health, safety, and environmental quality and the cost and accessibility of minerals; (4) potential minerals resources of lands possessed by the federal government; (5) the financing, formation of capital, and tax policies connected with mineral procurement; (6) substitution, conservation, and recycling of minerals; (7) competitiveness of United States minerals industries as compared to their foreign rivals; (8) sufficiency of research and development related to minerals; and (9) sufficiency of the capabilities of the federal government to support the policy creation of that government. The respective agencies responsible for each of these areas are the (1) Minerals Review Committee (MRC), (2) Department of State (DOS), (3) Environmental Protection Agency (EPA), (4) Department of the Interior (DOI), (5) Department of the Treasury (DOTR), (6) Department of Commerce (DOC), (7) DOI, (8) National Science Foundation (NSF), and (9) DOI.[2a]

One inadequacy of this review from the B'nai B'rith point of view is that the issue of the possible long term scarcity of mineral resources is not considered. The decision to omit this possibility was based on the indication of the National Commission on Supplies and Shortages (NCSS) that reserves of most minerals are adequate to satisfy the expected requirements until the end of the twentieth century. The NCSS also indicated that it felt that an indefinite supply of mineral materials could be obtained from the mineral resources of this world provided that sufficient investments of capital are introduced into the production capacity and technology for processing ores whose mineral materials content would be continuously shrinking. This indication by NCSS that an indefinite supply of mineral materials from this world could be obtained with sufficient capital is regarded by B'nai B'rith as completely wrong. There are several reasons for the position taken by B'nai B'rith.

One reason is that there is only a finite supply of mineral materials. After each time a particular material would be recycled, it would be found that a certain amount of material would have been lost from the world system of humanity. A second reason is obtained from a sociological point of view. As time goes by, more

---

[2a] "Report on the Issues Identified in the Nonfuel Minerals Policy Review." Review conducted under procedures of the Domestic Policy Review System of the Executive Office of the President, August 1979.

[2b] "Background Papers: Draft for Public Review and Comment of the Report on Nonfuel Minerals Policy Review." Review conducted under procedures of the Domestic Policy Review System of the Executive Office of the President, August 1979.

66-705 O - 80 - 16

and more controls might have to be instituted in order to assure the maximum recovery of recycled materials. A third reason with regard to the environment as a whole is that as time passes it would become increasingly necessary to disrupt the environment as ores of lower and lower quality were obtained and processed. The amount of capital required for the procurement and processing of ore and the recycling of mineral materials would have to keep increasing with a concommitant situation of diminishing returns arising for each unit of capital investment. The increasing utilization of capital in this manner is a dubious proposition.

B'nai B'rith feels that the utilization of capital in the above manner is not the most efficacious way for the United States to proceed. A certain amount of capital should be used to increase the mineral resources available to this nation by broadening the environment accessible to the United States. The extra-terrestrial environment could and should supply an order of magnitude increase in the mineral resources available to the nation in the coming decades. Such an investment approach would become increasingly more efficacious with the passage of time as compared to the route charted by the NCSS. The B'nai B'rith position demonstrates the importance of any document that purports to regulate to any extent the exploitation of any minerals resources base by the world community. The MT purports to be such a document.

In the DPS–PCC nonfuel minerals review in order to focus the review and to provide the opportunity to investigate problems generally representative of problems in other minerals areas of importance to some portion of the economy, twelve mineral materials were chosen for examination, namely aluminum, asbestos, chromium, cobalt, copper, iron ore and scrap, lead, manganese, nickel, phosphate, silver, and zinc. Iron and steel, aluminum, copper, lead, silver, and zinc represent the basic metal industries. Manganese, chromium, and cobalt are three materials for the acquisition of which materials the United States is almost completely dependent upon sources in other countries. In the case of phosphate, the United States is a major supplier to the world. A number of these minerals have environmental aspects of one kind or another. Of the twelve materials, nine are included in the strategic stockpile program of the federal government. The foundation of the Defense Materials System of the United States comprises steel, aluminum, copper, and nickel. Copper, nickel, cobalt, and manganese are four materials frequently mentioned in connection with ocean mining. More intensive recycling, as opposed to obtaining these materials via mining activities, the review feels, of almost all of these minerals would constitute a contribution to energy conservation and reduce harmful impacts upon the environment. International discussions have been and are being held concerning copper, lead, zinc, and bauxite. These discussions include proposals for means of attaining the stabilization of prices. The time frame of concern to the review is the period from the present to the end of the twentieth century.[2a]

In the area of foreign supply dependence, the issue of primary concern lies in the situation that the future supplies of a number of imported minerals critically needed by the United States and its allies are becoming more insecure. The materials of most concern in this regard are chromium, manganeses, cobalt, and the platinum group of metals.[2a 2b]

The basic issues and problems confronted by the United States and its allies in the present with respect to the availability of foreign minerals are essentially the same as those issues and problems encountered by these nations during the two world wars. One problem includes national security difficulties, import dependence, and access to minerals in times of crisis. Another issue is raised by the inhomogeneous global distribution of mineral resources. This nation and its allies must contend with a constantly fluctuating international market structure having complex foreign trade and investment patterns. The lack of information of both a reliable and consistent nature as to the significant aspects of foreign mineral policies and stockpiles constitutes another problem. It is necessary for the federal government to continuously face the whole issue of the availability of minerals as a fundamental portion of the foreign policy of the United States. In recent times, however, the issues and problems confronting the United States have become more intense and more complex.[2b]

Since World War II, countries concentrated in Africa, Asia, and Latin America have attained independence. The polarization of these countries into a Third World system or a lesser developed country (LDC) group has added a significant new element into global politics.[2b] The existence of the LDC group has been a major reason for the increased concern among the industrialized nations, among which nations are the United States and its allies, since 1970 with regard to the supply of minerals available to them. The LDC group includes major producer nations of minerals. There is an increased determination among the LDC minerals producer

nations to obtain as much and as many socioeconomic benefits as possible via the exploration, processing and distribution of LDC natural resources. In essence, the LDC nations are endeavouring to duplicate the experience of the Arab countries by creating situations analogous to the petroleum market for other natural resources. By some people in the LDC community, the Organization of Petroleum Exporting Countries (OPEC) is looked upon as a model as to what can be done with other natural resources. Needless to say, B'nai B'rith firmly believes that the existence of OPEC and its operations is not in the best interests of the United States. For the United States to allow OPEC type situations to arise with respect to nonfuel minerals when this nation has the power to prevent such developments would be totally self-destructive on the part of this nation. The creation of the MT is very much a result of the LDC minerals producers. It may well represent the first step toward creation of an OPEC type situation with regard to the natural resources of the extra-terrestrial environment.

The MT is simply the most recent development arising from a series of international efforts involving the LDC group. These efforts have been displayed in a variety of international assemblies dealing with "resource diplomacy".[2b] In 1969 the United Nations General Assembly passed a resolution that declared a moratorium on the exploitation of seaboard resources pending the establishment of an international seabed regime. In October 1973 OPEC instituted a petroleum embargo. In response to a request by Algeria, the sixth Special Session of the United Nations General Assembly was called in order to discuss problems of raw materials and development. At this Special Session, a declaration and a program of action on the establishment of a New International Economic Order (NIEO) were approved. The NIEO constitutes a demand for a modified economic system biased in favor of the LDC group with the intention of rectifying what the LDC group regards as an unduly large amount of wealth possessed by the industrialized nations. The regular twenty ninth session of the United Nations General Assembly in December 1974 approved demands by the LDC group with respect to their obtaining preferential trade and monetary settlements, larger aid flows, delays on payments of debts or outright cancellations, commodities arrangements, and a role in global decision making.

Much of the General Assembly Declaration and Programs of Action on the Establishment of a New International Economic Order of the sixth Special Session does seem reasonable when taken at face value. A serious examination of the document shows that it is very much biased in favor of the LDC group with very little consideration given to the legitimate needs and wants of the industrialized nations of the Western Hemisphere.[3]

The initial statement of the raw materials programs for action of the Declaration with its call for the termination of all kinds of foreign occupation, social discrimination and segregation, any kind of colonial, pseudocolonial, and foreign domination and exploitation by each nation having permanent sovereignty over its natural resources [3] has a strong taint of paranoia and essentially casts the industialized nations, including the United States, as villains against which the members of the LDC group have to guard themselves. This statement implies a polarization between the LDC group "good guys" and the industrialized "bad guys". The statement of most import in the raw materials programme of the Declaration is the statement wherein associations of producers are to have their functioning facilitated and their aims advanced. The associations of producers are to make joint arrangements for marketing, to provide for orderly trading of commodities, to provide for increases in the income from exports of producing members of the LDC group, and to improve the terms of trade for the LDC group. The statement concerning the associations of producers is softened for the industrialized nations by the inclusion of a phrase that all of the nations of the world should benefit by the associations aiding in sustaining the growth of the global economy. What the statement about the associations of producers means is that producers of the various raw materials should try to organize into monopolistic type structures and try to back the industrialized nations of the West up against a wall. A situation wherein in one group of countries tries to extort as much money and credit as it can from another group of countries is certainly not behaving in such a way as to improve the global economy. This type of behaviour will simply drive the industrialized nations into finding alternate sources of raw materials or utilizing synthetic materials on a wider scale than has been done previously. Of course, the LDC group could try to block the industrialized nations from utilizing alternate sources of raw materials as this grouping is attempting to do in the case of the Law of the Sea (LOS) negotiations. However, this

[3] Singh, Jyoti Shanker. "A New International Economic Order: Toward a Fair Redistribution of the World's Resources." New York and London: Praeger Publishers, 1977.

sort of negative active will produce severe reactions against the attitude of the LDC group as is already happening in the United States in the case of the LOS negotiations. The United States is already on the verge of enacting unilateral legislation which would allow United States companies to start mining the ocean sea bed and provide them with suitable protection by this nation. This position by the United States demonstrates that in trying to have everything their way, the LDC group could windup having nothing. B'nai B'rith is sympathetic to the plight of the LDC group and feels sad about the position this group has taken. B'nai B'rith feels strongly that there are courses of acton that can be taken by all of the countries of the world, both LDC and industrialized, that would be far more constructive than the proposals of he NIEO. These alternative courses of action should be discovered and put into action with the United States of America taking a leadership position.

The raw materials programme of action of the Declaration also asks for the evolution of a just and equitable relationship between the prices of raw materials, primary articles of commerce, products that are manufactured and partly manufactured that are exported by the members of the LDC group and the prices of food, capital equipment, primary articles of commerce, products that are manufactured and partly manufactured, and raw materials that are imported by the members of the LDC group.[3] Considering the way the words "justice" and "equity" are used on the international scene, it is readily seen that these words are often used in a very subjective manner. It has not been unusual, for example, for the Palestine Liberation Organization (PLO) to perpetrate acts of injustice against Israel without a word being said against the PLO in the UN. On the other hand, when Israel responds to such acts of injustice on the part of the PLO, Israel is readily chastised in the UN. A similar situation holds with respect to the United States and the Soviet Union. In the UN, the LDC group has been far more critical of the United States than it has been of the Soviet Union, a very unjust state of affairs in the opinion of B'nai B'rith. In this "justice and equity" statement the LDC group is orientd toward the attainment of a regulated global economy biased toward the LDC group. The United States generally has been oriented in the direction of a more free world market with a minimum of protectionism. While both the United States and B'nai B'rith are desirous of aiding the legitimate needs and wants of the LDC group, it is not appropriate, B'nai B'rith feels, for the LDC group to wish to attain its aims by its current mode of behaviour.

Another example of the counter-productive attitude of the LDC group is given by the statement in the raw materials program of action of the Declaration which statement has the objectives of the LDC group taking measures to broaden their markets for their natural products relative to the markets for synthetic products.[3] This market broadening is to take into account the interests of the LDC group and to make the most complete utilization of the ecological advantages of these products. This statement is an example of looking at a problem from the wrong angle. What the LDC group should be doing is to try to expand both its raw materials and synthetics production as it can best do, across the board. The LDC group should try to expand its synthetics production because raw materials are sooner or later exhausted. The LDC group should be actively working with the industrialized nations in order to expand the common resource base or humanity.

Part of the section on the program for action in the Declaration for an NIEO deals with the transfer of technology. [3] In the transfer of technology statement the program calls for a strenuous effort to draft an international code of conduct under which code technology transfer would occur in a manner that would correspond to the prevailing needs and conditions of the members of the LDC group. The remainder of this statement continues along the lines of an LDC group orientation without much consideration to the needs and wants of the industrialized nations. (This orientation runs throughout the entire Declaration.) Access to modern technology is to be made available to the LDC group on improved terms. It is not clear what is meant by improved terms. The phrase "improved terms" tends to bring to mind a vision of a beggar asking for a handout. The technology given to the LDC group should be appropriately adapted, states the Declaration, to the particular economic, social, and environmental conditions and the different levels of development among the members of the LDC group. It is not stated how much of the technology adaptation is to be done by the particular member of the LDC group and how much by the industrialized nations involved. There is to be a considerable expansion of assistance from the industrialized nations to the LDC group in the area of research and development programs and in the fabrication of appropriate indigenous technology. According to the technology transfer statement, commercial practices governing technology transfer are to be adapted so that these practices meet the requirements of the LDC group. Abuse of the rights of sellers is to be prevented. Promotion of research and development in exploitation and exploration, conservation, and the

legimate utilization of natural resources and energy of all sorts is to be attained at the level of international cooperation. In all of this technology transfer section, it is meant that the particular needs of the LDC group and those countries isolated from major bodies of water should be taken into account above all.

Singh refers to the NIEO as aiming to institute a process whereby the resources of the world will be redistributed in a fair manner. [3] This goal of redistribution is itself the main fault which B'nai B'rith finds in the NIEO as this economic plan is now constituted. The goal of redistribution is based upon the assumption that there is a fixed and finite amount of resources upon this planet. Hence, the only way for the LDC group to improve its lot in life is to take resources away from the industrialized nations. The foundation of the NIEO, namely, the notion of redistribution, is incomplete. B'nai B'rith believes that a truly humane and progressive NIEO would be one wherein all of the nations of the world work toward the generation of new resources accessible to the entire world and to assure that the resources, old and new, are equitably shared by all of the countries of the globe. The reasoning behind the NIEO implies that there is a conservation principle for wealth in that the total amount of wealth in the world can neither be added to nor can this total amount of wealth have an amount deducted from it. However, wealth can be added to the nations and economies of the world by, for example, developing new sources of energy. New mineral resources can be introduced into the global market place by first mining the sea bottom and then in the not too distant future by operations on the moon and on some of the astroids. Even if many members of the LDC group do not have much wealth for developing new mineral resources there are ways in which these members can contribute to this development. International co-operative development programs could result in wealthier nations providing the financing to the poorer nations for massive education and on-the-job training projects so as to allow the people of these poorer nations to more readily participate in the development of new mineral resources. This type of co-operation would benefit all of the nations participating in such programs.

The problem with the NIEO as it is now constituted is that it resembles too much a two-person zero sum strictly competitive game.[4] The "two persons" involved are the LDC group and the industrialized nations. A zero sum game represents a closed system. In the area dealt with by the NIEO the closed system is the global economy. The NIEO does not recognize the possibility of accepting new inputs into the systems so that the game is no longer zero sum. Extra-terrestrial resources is one such input that would definitely get the world out of the zero sum situation. The MT as it now stands with its attitude of inhibiting the expansive utilization of extra-terrestrial resources is symbolic of an entire way of thought that would perpetuate the existence of the global economy as a closed system. The tragedy of a closed system global economy is that whether or not the LDC group or the industrialized nations comes out ahead in the game, the other side will be on the losing end. It is important that the LDC group realizes that it is to its own advantage to work together with the industrialized nations in developing the potential benefits of the extra-terrestrial environment to the maximum possible extent in the shortest possible time. In this way the game becomes a non-zero sum activity so that both sides come out ahead.

It is clear to B'nai B'rith that the LDC group with its call for an NIEO is definitely not behaving in a constructive manner. They are acting as if the rest of the world owes them a living. They do not seem to realize that the United States, the Soviet Union, and the rest of the industrialized nations attained their positions through hard work and the accumulation and the expenditure of capital over a long period of time. B'nai B'rith feels strongly, indeed, that the industrialized nations should give those of the LDC group all the aid they need and could use to help themselves. B'nai B'rith feels equally strongly that the industrialized nations should not allow themselves to be put into any sort of position whereby the membership of the LDC group could have a stranglehold upon the industrialized nations. If necessary the members of the LDC group must be forced to help themselves out by building their own economic and industrial foundations. It is not healthy for the United States and its allies and, in the long term, for the LDC group, for the LDC members to put themselves into a parasitic relationship with the industrialized nations by the LDC group leaching away the wealth of the industrialized nations in return for the supply of natural resources by the LDC members. This type of behaviour would tend to assure that the LDC members indeed remain in a less developed stage while at the same time the economic, political, and social structures of the industrialized nations are weakened. The behaviour of the LDC group with

---

[4] Rapoport, Anatol. "Two-Person Game Theory: The Essential Ideas." Ann Arbor: The University of Michigan Press, 1966.

respect to its natural resources is yet another example of people wanting something for nothing. Issues related to the NIEO have been discussed at many meetings and conferences since December 1974, one such event being the seventh Special Session of the United Nations General Assembly in September 1975.[2b]

Many nations of the world are contracting parties to the General Agreement on Tariffs and Trade (GATT). The United States of America is one of these contracting parties. Originally intended as a stopgap measure on the road to the creation of an International Trade Organization (ITO), GATT has itself become the only international trade organization, while the original concept of the ITO has never materialized. Essentially, GATT has become a de facto ITO.[5]

The objectives of GATT is to produce a heightening of living standards, ensure full employment, ensure a large and steady growth in the volume of real income and effective demand, develop the full use of global resources, and increase the manufacture and trade of goods. This objective is to be obtained by the nations signatory to GATT making arrangements with each other that are both reciprocal and advantageous to all of the parties concerned. These arrangements are to be aimed at substantially reducing tariffs and other barriers to global trade. The arrangements are also intended to abolish acts of discrimination in world commerce.[5]

GATT since shortly after its inception has attempted to take into account the special needs of the LDC group. Many of the issues involved with the trading problems of the LDC group and the solutions proposed for these problems require cooperation on a global basis. At the 1962 Cairo Conference on Problems of Economic Development, some of the participating nations stated that they wanted to achieve co-operation within the structure of GATT in order to protect the interests common to them. Other members of the LDC group, not being informed as to the actual efforts by members (also called Contracting Parties) of GATT to take into account LDC group problems in the activities of those members, have been critical of GATT. In 1962, the United States proposed that an investigation should be undertaken by GATT members as to the ways and means by which non-members of GATT that are in the LDC group could contribute to and share in the work of GATT. At that time, members of GATT that were also in the LDC group expressed some criticism of this proposal. These LDC members of GATT felt that LDC non-members might receive all the advantages of membership without having to carry any of the obligations of membership. The LDC members also thought that this investigation could lead to an inferior sort of membership which would not be to the satisfaction of LDC members of GATT.[5]

The origin of much of the difficulties in the relationships between the industrialized nations and the countries of the LDC group is the fact that many nations of the LDC group were at one time colonies of the industrialized nations. The result of this history is that a number of emotions come into play. An LDC could feel resentment toward an industrialized nation that was once its ruler because the LDC believes that the industrialized nation has attained its current pinnacle by exploiting the resources of the LDC. (In this context, references to the feelings of a nation can mean the feelings of the government of that nation or the feelings of segments of its population or of various of its individuals, or a combination of the government, segments, and individuals. The combination could consist of the government, segments, and individuals, or government and segments, or government and individuals, or segments and individuals.) The LDC could have a rankling sense of interiority that could make it want to "get even" and to get its just due from any and/or all industrialized nations with which it is in contact. This kind of emotion lies behind a considerable amount of the bargaining stance which members of the LDC group display in international negotiations and meetings, whether these meetings and negotiations concern multilateral trade agreements between nations or deciding how to allocate the natural resources of the moon.

On the other hand, industrialized nations can have the feeling that members of the LDC group simply want a "free ride". The industrialized nations can also feel patronizing towards LDC group members. The feelings and emotions ebbing and flowing between the LDC group and the industrialized nations make it difficult for these two sets of countries to deal with each other as equals. However, knowledge of the existence and the nature of these emotional currents allows for compensation for these currents in interactions between the LDC group and the industrialized nations. Individuals from all of the countries meeting at the various international forums should try to understand the feelings of the various participants in these

[5] Curzon, Gerard. "Multilateral Commercial Diplomacy: The General Agreement on Tariffs and Trade and Its Impact on National Commercial Policies and Techniques." New York and London: Frederick A. Praeger, Publishers, 1965.

forums so that arrangements will be arrived at that are more mutually satisfying than would be otherwise attained.

Trade is an important factor in the growth of the economy of a country. During the nineteenth century, the prime cause for the spread of wealth from the rich countries to the poor countries was considered by economists to be the increasing demand for the exports of a developing country in the markets of the industrialized nations.[5]

H. Myint [6] has applied the work of Adam Smith [7] to the relationship of international trade to the past and present economic development of the LDC group of nations. He notes two basic ideas of Smith. One idea is that international trade allows the strictures of the domestic market of a country to be transcended. This trade is the source of a route outside of the country for products created beyond the amount needed for domestic requirements. This first idea leads to the "vent for surplus" theory (VST) of international trade. The second idea is that the broadening of the extent of the market brought by international trade results in an improvement of the division of labor, in which process the general level of productivity within the country is raised. This second idea leads to the "productivity" theory (PT) of international trade.

From the point of view of PT, international trade is a dynamic force. By both broadening the extent of the market and the area of activity utilizing the division of labor, this force increases the skill and adroitness of workers, stimulates technological innovation, transcends technical quantities that cannot be divided, and in general gives to the trading country the ability to realize rising returns and economic development. According to the work of Smith, in order to meet the export demand, a country adapts and reshapes its productive structure. This process of specialization is not readily reversible. A country specializing for the export market becomes more vulnerable to changes in the terms of trade than it would be in the absence of that specialization. There is a trade-off between taking advantage of the export market and adaptability to change.[6]

The belief in the Smithian PT by the governments of colonies during the nineteenth theory led these governments to take active steps so as to encourage trade by the colonies. This belief and the colonial governmental acts which it inspired led to the association of the Smithian PT with colonialism. Myint [6] believes that the Smithian PT does not quite explain the rapid expansion of both the total value and the physical output of the exports of these colonies. That is, this expansion was not really due to improvements in labor division and specialization which in turn resulted in innovations and cumulative improvements in abilities and productivity per man-hour. According to Myint, there were two reasons that were actually responsible for the increase per man-hour. One reason was the conclusive increase in productivity accompanying the shift of labor from the subsistence economy to the plantations and mines. The other reason was the growth of the duration of the working day along with the rise in the fraction of labor gainfully employed relative to the partly inactive labor of the subsistence economy.

There are a number of reasons for the conclusive or once and for all nature of the considerable increase in productivity that arose from the labor shift from the subsistence economy to the mines and plantations with their much greater capital output ratio and skilled management.[6] The first reason is that the native labor coming from the subsistence economy was inexperienced and technically ignorant. The second reason is that this labor incurred high rates of turnover. This meant that it was not susceptible to attempts to increase productivity. This beginning experience created and/or produced an ingraining of the concept of cheap labor in the over-all economy which concept led to looking upon native labor as an amorphous chunk of low grade manpower to be utilized with a minimum of capital investment. This cheap labor concept meant that when labor in a given region was more or less being completely utilized the result of this situation was not to make more efficient use of regional labor by adding more machinery to the region and by reorganizing the methods of production but instead was to acquire more cheap labor from outside the region. The tendency to use cheap labor was reinforced by the pattern of the demand for raw materials as the global market expanded in a series of waves. When the world economy was flourishing, raw materials output had to be increased as rapidly as possible along cheap labor lines so that there was no time for the introduction of new techniques or for the reorganization of production. When the world economy was in a state of declining activity, it was difficult to raise

---

[6] Myint, H. 'The "Classical Theory" of International Trade and the Underdeveloped Countries' in The Economic Journal, June 1958, p. 317.

[7] Smith, Adam. "An Inquiry Into the Nature and Causes of the Wealth of Nations." Cannan Edition. New York: Random House, Inc., 1937.

the capital which new techniques and production reorganization would have required. Consequently, the growth of international trade during the nineteenth century among members of the LDC group was basically due to a process based on constant returns and somewhat inflexible combinations of factors. This kind of expansion process could proceed smoothly only if it could acquire additional supplies of factors in the necessary proportions.

Consider now the VST.[6] This theory starts with the assumption that a formerly isolated country on the verge of entering international trade possesses a surplus productive capacity with respect to its domestic requirements. The function of trade is to provide the new effective demand for the production of the resources which would have stayed unused without the presence of trade. Trade in VST does not have much impact on the reallocation of given resources. The implication of VST is that the production of export goods can grow without necessarily causing a reduction in domestic production.

An implication of the concept of the existence of surplus productive capacity in VST is that there is an inelastic domestic demand for a commodity which commodity can be exported.[6] Further, there is or can be a considerable amount of internal (that is, within the country) immobility and specific allocation of the resources required for the production of the exportable commodity.

Adam Smith used VST as an argument for free trade.[6] In the case of a country that was previously isolated and on the verge of commencing trade, the existence of a surplus productive capacity which is suitable for the export market represents a route toward the acquisition of imports and the expansion of domestic economic activity without incurring much in the way of additional costs.

On the other hand, VST can be used as an argument against trade.[6] In the case of an established trading country in a constantly changing global market, the existence of a considerable surplus productive capacity which capacity cannot conveniently be transferred from export to domestic production makes that country vulnerable to external economic perturbations. The concept of vulnerability in VST is different from the way vulnerability is used in PT. In PT, vulnerability arises as the consequence of the country having adapted and reformed its productive structure so as to meet the requirements of the export market through a specialization process. The vulnerability then originates from the possession of a considerable productive capacity which the country cannot use for domestic production. Myint believes that the vulnerability of the industrialized nations is of the VST type, while the vulnerability of most of the members of the LDC group is of the PT type.

VST provides a more effective approach toward understanding the expansion of international trade among members of the LDC group during the nineteenth century as compared to the comparative costs theory (CCT).[6]

In CCT, given resources and given techniques are assumed to be present in the trading country. In the LDC group there was a high rate of export production on the part of many of its members during the nineteenth century. In the agricultural domain, expansion resulted from extending cultivation using traditional production methods. In the mining and plantation domains expansion resulted from increased cheap labor supplies while capital investment was kept to a minimum. The industrialized countries provided improvements of transport and communications and the discovery of new material resources. This was their contribution to the expansion process. The industrialized country contribution, according to Myint,[6] resulted in increasing the total volume of resources instead of making the given quantity of resources more productive.

The CCT fails to explain some differences in the course of the development of members of the LDC group which have approximately the same type of climate and geography, although this theory is formulated in terms of the qualitative differences in the resources available to the trading countries. For example, Burma developed into a major trade exporter of rice, while India developed into a net importer of rice. In this example, the VST points out the population density as a major determining factor of export capacity.[6]

According to CCT, a country on the verge of entrance into international trade is assumed to possess as a pre-conditioned a highly developed and flexible economic system. Such a system can deal with a broad range of possible changes in the relative supply of production factors by suitably adapting its methods of production and factor combinations. However, the economic structure of a typical member of the LDC group is not so sophisticated and can only make crude adjustments. The technical coefficients of an LDC are closer to being fixed than to being variable, given the operating conditions of such a country with its sparse technical and capital resources. An LDC has an inelastic demand for its domestic production, consisting mostly of basic agricultural products, and, also, for its commodities for export, consisting mostly of industrial raw materials. This inelasticity leads to the

inability of an LDC to make significant adjustments by varying the outputs of various commodities which commodities need different ratios of factors. The VST provides a more appropriate explanation for this situation than does the CCT.[6]

Myint has presented some policy implications based on his analysis.[6]

One implication arises from the situation that population pressure in an LDC can lead to a reduction in its capacity to export. This reduction occurs because natural resources are diverted from export production to subsistence production. This diversion leads to a diminishing return on investments because of the shift from more productive utilization to less productive utilization. Assuming a constant total flow of resources, this diversion means that there is a loss of resources available to the more productive resource utilization section of the economy. The analysis of Myint indicates that it is considerably easier to encourage the growth of the money economy when an LDC is just initiating international trade than it would be later when the trade has developed. This relative ease is understandable because initially there is a large amount of surplus land and labor. This surplus is a decreasing function of time. In order to counteract this circumstance, Myint believes that the government of an LDC must vigorously interfere with this process. The government should have a policy aimed at ovecoming the rigidities of an LDC economy and attaining comparative costs equilibrium.

Another implication drawn by Myint [6] arises from the existence of surplus productive capacity in an LDC economy. This surplus provides a relatively inexpensive means for acquiring products for import without the necessity of extracting resources from domestic production. All that is required is the more complete utilization of semi-idle labor. This situation was particularly true for the LDC group during the nineteeth century. Making more efficient use of labor, Myint believes,[6] is a good argument for an LDC participating in free trade.

A third implication drawn by Myint [6] from his utilization of the concept of surplus productive capacity is the discounting of the idea that the international trade patterns of the nineteeth century produced an export bias within the economies of the members of the LDC group. By an export bias is meant the deliberate diversion of resources from investment in domestic production to production for export through the application of a government policy. The notion of such a bias arose after the industrialized countries attempted to introduce export stimulating policies into tropical members of the LDC group. According to critics of the policies, the industrialized nations attempted to rationalize such policies in classical free trade theory terms and by utilizing Smithian doctrine. (This doctrine is that international trade provides a dynamic force leading to an increase in the general productivity level of the trading countries.) These critics feel that this rationalization is just a cover up for the desire of the industrialized countries for markets for their manufacturers and for their acquisition of raw materials. Furthermore, the critics state that this process of trade resulted in the economic structure of members of the LDC group developing an export bias. In turn, the critics says, this bias increased the vulnerability of members of the LDC group to variations in the global market. Myint [6] denies the validity of this export bias notion in both the peasant export production and the mining and plantation export production sectors of members of the LDC group during the nineteenth century.

Consider the peasant export production sector in an LDC when this LDC was just developing an international trade. At that time the LDC did not have much of a population and had considerable surplus land. The LDC could then have chosen either to employ its surplus resources in export production or not to use these resources at all. With the passage of time, there would have been a tendency for a bias against exportation to develop, instead of a bias toward exportation, because of an increase in population pressure.

With regard to the mining and plantation export production sectors, the determination of the existence of an export bias must be arrived at from the point of view of examinaing the allocation of foreign capital and technical resources. The question to be answered is "Could these capital and technical resources have been switched from being input to the mining and plantation export sectors to being input to the domestic sector?" The answer that Myint [6] gave at the time of his work is that few governments of the LDC group have managed to attract a significant portion of foreign investment into their domestic industrial sector as compared to their mining and plantation export production sectors. The colonial governments did not have the option of attracting investment to the domestic sector as well as to the export sector. The option these governments did have was one as to how much foreign investment could be drawn into the export sector.

Myint places considerable emphasis on discounting the export bias motion.[6] His reason for doing so is because the adherents of the export bias notion do not believe that the production for export of raw mateials was only unduly expanded relative to

the domestic sector. The adherents believe that this production was unduly expanded per se. Myint [6] feels that the belief in the export bias concept is an obstacle in working out plans for the development of an LDC. This obstacle could be said to be partly of a psychological nature. Believers in the concept of an export bias feel that the production of raw materials for the export market is the same as preserving the colonial pattern of trade. The colonial pattern of trade is part of the bad old days. Anything that is a remainder or a remnant of the days of imperialism and colonial exploitation must be eliminated is the way many people think. Reality is very often a subjective matter. The same events and patterns in history are perceived and understood in different ways by different interpreters and observers of those events and patterns. If a certain type of behaviour and action has occurred in a context that was unpleasant then it becomes an emotional manner in ascertaining the worth of this behaviour and action in a different context. The belief in the export bias is dangerous because this belief is one of the factors accounting for the diversion of capital investment and technical resources from the peasant export sector to industrial development projects. Such projects sometimes offer more in the way of trying to add to national honor and prestige than to actual development. The export bias belief also damages the mining and plantation export sectors because this belief leads to nationalization, restrictions and regulations in these sectors. Because of the decrease in the vigour of the export sectors which acting on the export bias notion brings, an LDC will lose some of the foreign exchange needed for its economic development.

There are three conclusions which Myint arrives at concerning the development of the members of the LDC group of nations.[6] The first conclusion is that most of the cost of the economic plan of an LDC which plan is oriented toward the attainment of increased national self-sufficiency or the export of manufactures will have to be borne by the LDC itself. The second conclusion which B'nai B'rith believes Myint would feel is almost as true now as when he originally wrote it is that the foreign exchange required for these development plans can be earned by the LDC group of nations only by the export of raw materials. The third conclusion following from the first two conclusions is that in order to accomplish the successful pursuit of the development plans of the LDC group it is very important for them to carry out export drive policies which in a technical sense could have similarities to the export drive policies of the colonial governments of the nineteenth century.

According to Haberler,[5 8] there are four indirect benefits to be derived from international trade. One benefit is that trade is a source of capital goods, raw materials, and machinery. The second benefit is that trade provides a vehicle for the dissemination and transmission of ideas, skills, managerial talents, and technological knowledge. The third benefit is that trade provides a means for the movement of capital on a global scale. The fourth benefit is that it is both the best policy to follow in order to deter monopoly and the best guarantor of the maintenance of a goodly amount of free competition.

Utilizing the hypothesis now known as the international demonstration effect, Nurske has stated that contact with the economies of the industrialized nations damages members of the LDC group because it increases the tendency of LDC group members to consume which consumption is a discouragement to saving and prevents investment.[5 9] The hypothesis is not a valid one because it is partly a result of neglecting the difference between potential and effective demand. In order to purchase new kinds of consumer goods, it is first necessary to earn the income required to purchase them. International trade is a very strong means for securing economic development because it is an incentive to earn such income. The new wants of the people of an LDC lead to a higher level of economic performance on their part. It is the absence of this higher performance level which is and was basically responsible for much of the stagnation of the LDC world. In addition to creating new wants, international trade inculcates new attitudes among the people of an LDC. These attitudes are exemplified, for example, by the desire to raise cash crops. These attitudes are an aid toward integrating into the exchange economy those economic practices which are of the most help for economic development. This shows that trade is both statically and dynamically productive. Bauer [10] and Curzon [5] feel, however, that the concept of free trade for members of the LDC group should be modified in the case of fledgling industries in the LDC group. In this case where an

---

[8] Haberler, Gottfried von. "International Trade and Its Relations to Planning and Development." Cairo: National Bank of Egypt, 1959.

[9] Nurske, R. "Problems of Capital Formation in Underdeveloped Countries." Oxford: B. Blackwell & Co., 1953.

[10] Bauer, P. T. "Economic Analysis and Policy in Underdeveloped Countries." London: Cambridge University Press, 1957.

allocation of global resources occurs there should be provision for protecting these young industries.

The members of the LDC group did not, at first, react eagerly to the idea behind the ITO, that idea being one of a world trade organization which organization would ensure free multilateral trade for all of its members. The LDC group wanted reservations put into the ITO Charter for what it considered to be its special situation. The LDC group point of view estranged many of the individuals, groups, and countries who were in support of the ITO Charter. This point of view was also responsible for a considerable amount of the criticism presented by those who eventually opposed the ITO Charter.

The position of the LDC group was the result of its experience in the period just before World War II when the terms of trade under which the commodity exporters operated had significantly been degraded for those LDC exporters. This made the LDC group feel that the dependence on foreign markets for the sale of its commodities was a situation against which it had to take protective measures. The LDC group felt that they could not influence the export markets. This led it to concentrate on taking measures to protect its fledgling industries. The form that this protection took was that the members of the LDC group obtained important exceptions for themselves in the ITO Charter.[5]

The members of GATT determined the basic errors in the approach of the LDC group members. The analysis of the GATT members led them to the conclusion that the need for a "vent for surplus" for the LDC group in the twentieth century was even more important than it had been in the nineteenth century. The reason for the difference was that a greater proportion of the exports of the members of the LDC group were manufactured goods. These manufacturers were experiencing a greater difficulty of access to the global market than were raw materials. It was under GATT auspices that co-ordinated action on an international level was taken in order to correct the initial incorrect assumptions made by GATT.

The MT is very much a product of the mode of thought of the LDC group in both what is actually stated on paper and the type of thinking behind the explicity stated words. From both points of view, B'nai B'rith has formulated the opinion that the LDC group is making at least as big an error in its thinking with regard to extra-terrestrial resources as it did when GATT was just beginning. None of the analyses of which B'nai B'rith is aware concerning the relationship between the industrialized countries, the LDC group, and natural resources considers the question as to how a tremendous source of natural resources externally located with respect to both the industrialized countries and the LDC group could best be used to secure and accelerate the development of the two sets of countries. The LDC group is analyzing the effect of the utilization of extra-terrestrial resources as it relates to its own interests in a very near-sighted way such that the LDC group could wind up harming itself. The LDC group is apparently reasoning by analogy. Reasoning by analogy can be an effective means for dealing with a problem. Reasoning by analogy can also be treacherous and lead to erroneous conclusions if improper analogs are chosen for the basis of the reasoning process.

One article was put into GATT to provide for adjustments to this agreement for reasons of economic development.[5] This Article XVIII provided for exceptions from the other provisions of GATT in order to promote the establishment, development, or rebuilding of a specified industry. From its earliest days of existence, the original Article XVIII was not applied automatically through the granting of releases. The viability of a given proposed industry had to be demonstrated by the country wishing to establish it. Then, the agreement of other members of GATT whose exports would probably be affected had to be obtained. The country setting up the new industry had to establish a time limit during which it wanted the restrictions to apply. During the period of the release, the country seeking relief had to submit regular reports on the progress of the young industry. This country also had to report on the administration of the quota system and on the tariff measures which it had established. In this manner, the members of GATT were given some measure of control over the new industry. This system of application of Article XVIII probably inhibited most countries from utilizing this article. On the other hand, Article XII of GATT allowed import restrictions for balance-of-payments reasons and was considerably easier to utilize than Article XVIII. The relative ease of utilization of Article XII by the industrialized nations in contrast to the difficulty of use of Article XVIII by members of the LDC group led to friction.

After a general review of GATT in 1954 and 1955, a new Article XVIII was adopted[5] in order to replace the old one. The general purpose of the new Article XVIII is to provide for governmental assistance for economic development. The incorporation of exceptions to GATT while staying within GATT were achieved by Article XVIII stating that the attainment of the objectives of GATT are to be made

easier by the evolutionary development of the economies of those countries, in particular, those countries which are signatory to GATT, which have economies that can only carry low standards of living and are young from the developmental point of view. The protection measures oriented toward development were primarily to be sufficiently flexible tariff measures capable of bestowing the tariff necessary for the founding of a specific industry. The quantitative restrictions were primarily confined so as to act, as much as possible, only on the lack of equilibrium of the balance-of-payments of the LDC making use of Article XVIII. The restrictions were to be applied so as to fully account for the sustained high level of demand for imports which would probably be produced by the economic development program of an LDC.

A development policy for an LDC does not necessarily mean that the LDC will encounter a balance-of-payments deficit. A development policy can be formulated in such a way that a balance-of-payments is maintained with an adequate reserve level. At the time of the enactment of the new Article XVIII, Curzon [5] felt that an LDC would have nothing to gain by a policy that would disturb the equilibrium of its balance-of-payments. B'nai B'rith agrees that this was true then and it is still true now. An LDC following an economic policy that maintained its balance-of-payments in equilibrium would use tariff adjustments as a price mechanism to protect any of its young industries and not use the quantitative restrictions approach.

The new Article XVIII provides that if an LDC should impose any restrictions upon trade without obtaining the collective express permission of the signatories to GATT, then any member of GATT affected by these restrictions is free to take whatever action it feels necessary to return the balance of benefits to the original state. This provision would restrain an LDC from taking unilateral action which action would damage the very market the LDC requires. A resort to unilateral action would be allowed only after certain conditions with regard to consultations among the signatories to GATT had been fulfilled.

This Article XVIII is also only intended to be applicable to countries which have a low standard of living and are in an early stage of development.[5]

Further, when this article refers to the founding of a specific industry the action of founding is interpreted several ways. Thus, the article covers the founding of a previously non-existent industry, the founding of a new line of production in an existing industry, or a considerable increase in growth of an existing industry which industry supplies only a relatively small proportion of the domestic demand of the LDC.

The industrialized countries have very often placed unjustifiable trade barriers in the path of the LDC groups.[5] An LDC which has developed saleable items will find itself faced with a tariff barrier raised by an industrialized country in order to protect equivalent items in the industrialized country from competition. When an LDC has worked hard to accumulate the investment capital, made changes in its social structure, and changed its labor patterns in order to produce goods for export, it is easy to understand the feeling of resentment the people of that LDC would feel when faced by barriers to export. This kind of history is part of what has to be examined in order to adequately understand the feelings of the LDC group as it aided in the formulation of the MT.

Curzon [5] feels that a good case can be made on the basis of the dialogues within GATT for substituting unilateral trade concessions on the part of the wealthy industrialized nations for foreign aid on the part of these nations. If the industrialized nations truly wish to help the LDC groups, in the long term, trade opportunities would be of more benefit than simply giving aid. This mode of operation would ensure the development of new industries in viable surroundings. Under these conditions of increased trade opportunities, the export earnings of an LDC would rise rapidly enough to pay for its import requirements. The efficiency of the global market and economy would be raised as the result of increased specialization and division of labor.

The planning of its domestic economic policy by an LDC, insofar as it depends on aid from industrialized nations, according to Curzon, should take into account the impact of providing this aid upon the ultimate provider of this aid, namely, the productive individual in an industrialized nation. [5] Following his analysis, if the aid from the industrialized nation is provided by the government of that nation, then that productive individual while assisting capital goods investment in the LDC would be denied a certain amount of consumption at home. This would represent a foregoing of real satisfaction for the benefit of the LDC. The productive individual would be involved in a real transfer of wealth. In the case of aid from private sources, the productive individual would earn extra income. This extra income could be put into savings. In turn, these saving could become available for capital invest-

ment in an LDC. The private source approach to aid would thus result in a situation wherein the citizens in both the industrialized nations and the LDC group could obtain satisfaction.

In November 1964, the nations signatory to GATT added Part IV to that agreement.[5] Part IV comprises the additional Articles XXXVI, XXXVII, and XXXVIII. The purpose of Part IV is to further broaden the objective of the signatories to GATT in their endeavours to raise the standard of living and further developing the economies of the LDC group by recognizing the special needs of this group. In Part IV, the members of GATT state that the membership is going to undertake collective action so as to raise the exports of the LDC group by means of trade promotion. Both volume and price are to be taken into account for this promoting of trade. In order to diversify the economies of the LDC group, the global markets for primary products are to be stabilized and improved while stable, equitable, and profitable prices and favorable market conditions for processed and manufactured products are to be attained. The necessity for closer co-operation between the members of GATT, the World Bank, and the various United Nations financial organizations is expressed. A significant statement is made that the developed industrialized nations do not expect reciprocity when these nations make commitments to remove tariffs and other barriers to commerce in the course of trade negotiations.

Part IV specifically commits GATT to reducing and eliminating barriers to exports of particular interest to members of the LDC group. Existing barriers are not to be increased. Priority is given to the abolishment of fiscal protective measures. In the event of a failure to act, consultations of an obligatory nature could be required. The trade margins of exporting members of the LDC group are undertaken to be maintained by the signatories to GATT at equitable levels. This maintenance is to be carried out by GATT signatories endeavouring to control the resale price of LDC exports within the territory of these signatories. GATT members are to co-operate in the promotion of exports from the LDC group. The signatories also agree to stay away from using allowed commercial policy measures which are likely to have effects harmful to members of the LDC group provided that these members demonstrate similar consideration among themselves. Provision is also made for coordinating financial aid and trade policies.

During the Tokyo Round of Multilateral Trade Negotiations under GATT the members of the LDC group have attempted to obtain special and differential treatment.[2b] Such treatment is in direct conflict with the basic principles of GATT which principles assure reciprocal and nondiscriminatory behaviour among nations. This meeting is another instance of the LDC group trying to impose an NIEO upon the industrialized nations. At the fourth meeting of the United Nations Conference on Tariff and Trade (UNCTAD) in Nairobi in May 1976, the push for the NIEO was at least partly responsible for the formulation of the UNCTAD integrated program for commodities. This meeting of UNCTAD also proposed the formation of a Common Fund which would provide for financing the program.

The realization among the members of the LDC group of their numerical strength initially led them to behave in ways that caused disturbances in conventional trade patterns and institutions and in the traditional practice of certain aspects of international law.[2b] They were attempting to capitalize upon the dependence which the industrialized nations have with respect to the resources of the LDC group. The United States and other industrialized nations raised objections to the disturbing behaviour of the LDC group. For example, the United States opposed a UN resolution which would have placed a moratorium upon deep seabed mining. This nation also raised objections to the concept of a NIEO and the formation of a Common Fund.

Recently, members of the LDC group have become aware that their pattern of disturbing behaviour on their part and the attitude giving rise to this behaviour was often self-defeating so that these members have become more susceptible to accomodations.[2b] Similarly, the industrialized nations have made a shift towards meeting the desires of the LDC group. These realizations on the part of both the industrialized nations and the LDC group have resulted in some adjustment being made between the two sets of countries. For example, in February 1975, the Europen Economic Community (EEC) and a large number of members of the LDC group became signatories to the Lome Convention. A plan called STABEX constitutes the core of this Convention. STABEX is oriented toward helping certain export earnings of the LDC group to become stabilized. These earnings include those related to iron ore and concentrates. Again, a twenty seven nation Conference on International Economic Cooperation (CIEC) was convened between December 1975 and June 1977 to examine problems relating to minerals and energy. The United States representative was one of the eight representatives from the industrialized nations at CIEC.

There were also nineteen representatives from the LDC group participating in CIEC.

Another aspect of the world situation which aspect is also used in the evaluation of the MT is the development of global inflation and unemployment since 1974. The Domestic Policy Review of Nonfuel Minerals background papers [2b] describes the global market as having moved from a restricted commodity supply situation to a state in which a number of raw materials are in oversupply. From the B'nai B'rith point of view, it is equally, and perhaps more than equally valid to describe the situation as being one of underdemand. Raw materials in certain categories are not required because of the state of the global economy. To B'nai B'rith this means that the legitimate material wants of the world population are not being brought to fruition as rapidly as the problems of that population demand a resolution of its difficulties. One of the factors in determining the quality of life of any particular group of people is the ascertainment of the rate at which various raw materials are utilized. The current global situation, in addition to reducing the prices and export earnings of a number of members of the LDC group, are reducing the rate of progress of al of the countries of the world to reaching a far more equitable and expansive way of life. B'nai B'rith does not view global progress toward a better world society in simplistic terms of "either or". The "strait jacketing" of the industrialized nations by those members of the LDC group having possession of strategic natural resources does not necessarily mean that those members of the LDC group profiting from this situation in a financial sense will, in any way, attain an improved society. By an "improved society", B'nai B'rith means a society wherein the individual person is given the most opportunity to develop his or her potential to the maximum amount possible. Again, a plentiful supply of natural resources for an industrialized nation does not necessarily mean that it will attain an improved society. However, it is far more likely that a plentiful supply of raw materials can be utilized by an industrialized nation to improve the lives of its citizens than can the earnings from natural resources exports be used to improve the lives of its people by members of the LDC group. This difference arises because of the discipline which an industrialized nation has had to undergo in order to accumulate and to effectively use the capital which it has put into industrizlization. A member of the LDC group has a further way to go before it acquries the necessary discipline.

From the point of view of the United States, it is certainly not in its best interests for this nation to be dependent on any other nation or group of nations for natural resources that are necessary for its survival and growth. Some people in this nation feel that by permitting the United States to get into a dependency situation with respect to one or more resources, this situation will somehow aid the cause of global peace and aid the disadvantaged people of other nations. B'nai B'rith firmly disagrees with these people. Dependency by the United States upon other nations for strategic materials will lead to increased strife in the long run. Increased strife will decrease the probability of a member of the LDC group improving its lot in the world society. The current situation with regard to petroleum and OPEC demonstrates what could happen with other natural resources of stategic importance. The United States has had and is having difficulty dealing with the petroleum problem. There has even been consideration of the exercise of a military action by seizing the oil fields. it is a questionable matter whether or not the oil wealth of the OPEC group has done much in the way of improving the lives of the people of those countries. This judgment is made from the point of view of the tradition of progress in the history of Western civilization. In particular, the nation of Iran is in turnoil that is partly due to the application of its oil revenues to bring it to a more modern stage of development. The steady state society which Iran may eventually attain would probably be a somewhat restricted one. The options available to the individual for his or her choices in life will also probably be far fewer than would be considered desirable as perceived by an observer in the United States.

The DPS–PCC nonfuel minerals review discusses the availability of mineral resources to the United States both from the physical and from the political and economic points in view.[2b] Political and social factors can be determinants in influencing the circumstances under which investment and trade will occur. Unstable political and economic conditions can give rise to access problems with regard to strategic nonfuel minerals for the United States. Any analysis as to the availability of minerals must be made within the context of national security. The concept of "nonfuel mineral security" should be considered as a part of national security. Most of the nations upon which the United States depends for minerals are considered to be stable. Pursuit of nonfuels mineral security demands that this nation develop the means of acquiring nonfuels minerals from sources that are not dependent upon the whims of other nations. Aggressive development of the extra-terrestrial environment on the part of the United States can lead to a vast increase in natural

resources independence for this nation within a few decases. B'nai B'rith is a strong advocate of such development.

Michael J. Gaffey and Thomas B. McCord [11] of the Massachusetts Institute of Technology have proposed a way for obtaining natural resources from the extra-terrestrial environment. They also note, as does B'nai B'rith, that conveniently available deposits of such metals as copper, nickel, and iron are gradually being exhausted. Again, in agreement with the reasoning of B'nai B'rith, they are aware that the price to be paid in terms of time, money, and environmental impact for the discovery and development of low grade ores will become increasingly exorbitant.

Gaffey and McCord [11] propose that since many of the extra-terrestrial objects in orbit about the sun were formed of similar substance in a similar manner to the earth, it is reasonable to suppose that these objects contain the natural resources found on the earth. Confirmation of this supposition has already been obtained to a certain extent by the application of remote sensing techniques utilizing earth-based telescopes. In this manner, both nickel-iron objects and carbon compound rich bodies have been detected within the asteroid belt. These techniques have also revealed the existence of great areas of the surface of the moon which areas contain deposits of high titanium content. During the Apolloi Project, lunar samples returned to the earth from several sites revealed themselves to be of a high titanium content.

There may already be a direct connection between the extra-terestrial environment and the mining of one metal [11] ore. The ore is a nickel sulfide one. The connection is the Sudbury Astroblem in Ontario, Canada. Many mining geologists have identified this great structure as being of meteor impact origin. It is possible that the metal content of the Sudbury Astroblem came from the extra-terrestrial environment.[11 12 13 14 15] From 1961 to 1965 this structure in Canada yielded about half of the total global production of nickel.[16] This body of ore also contains major deposits of copper and other elements found in meteorites of the siderolite type.

The reasoning that Gaffey and McCord use to show the attractiveness of utilizing the extra-terrestrial environment as a source of natural resources from economic, political and environmental considerations is similar to the reasoning of B'nai B'rith. Extra-terrestrial resource procurement is attractive because it will produce significant financial and social returns.

In order to arrive at some idea of the financial returns to be expected, it is of interest to consider the potential value of an asteroidal mass containing one cubic kilometer of the metals nickel and iron. This volume of metals is delivered to the surface of the earth in marketable condition. A simple estimate yields the result that this body of metal would have a gross value of about five trillion dollars. This return probably could not be actually realized in the market place since within the near future such a magnitude of supply would considerably outstrip the demand. (Adjustments and accommodations would have to be worked out with the major terrestrial producers of iron and nickel in order to avoid catastrophic shifts in the economies of the producing nations. However, it is quite possible that as time goes by the existence of such a great supply of iron and nickel would stimulate an increase in the utilization of these metals in the fields where they are already used and also lead to the utilization of these metals in new areas of application where they are not presently used. If this increase in demand should occur, then the market values of nickel and iron would tend to rise again. With the arrival of more extra-terrestrial metals, the price would again tend to drop. After the occurrence of a few of these cycles, a steady state condition among supply, demand, and prices would probably be attained.

About two-thirds of the potential value of the first one cubic kilometer of meteoric metal would arise from its nickel content. This amount of nickel would supply the world for more than a thousand years at the current rate of consumption. Gaffey and McCord make a somewhat more realistic assessment of the economic return other than the original five trillion dollar figure by estimating the amount of nickel that could be sold and the price it would bring at some time in the future.[11]

---

[11] Gaffey, Michael J. and McCord, Thomas B. "An Extra-Terrestrial Source of Natural Resources." Massachusetts Institute of Technology Remote Sensing Laboratory Publication, Number 155, 1976.

[12] Dietz, R. S. "Sudbury structure as an astroblem" in J. Geol. 1964, Vol. 72, p. 412.

[13] Dence, M. R. "Meteorite impact craters and the structure of the Sudbury Basin" in "Geol. Assoc. of Canada, Special Paper No. 10," 1972, p. 7.

[14] French, B. M. "Shock-metamorphic features in the Sudbury Structure, Ontario: a review" in "Geol. Assoc. of Canada, Special Paper No. 10," 1972, p. 19.

[15] Dietz, R. S. "Sudbury astroblem, splash-emplaced sub-layer and possible cosmogenic ores" in "Geol. Assoc. of Canada, Special Paper No. 10," 1972, p. 29.

[16] Boldt, J. R. "The Winning of Nickel: Its Geology, Mining and Extractive Metallurgy." London, England, Methuen & Co., Ltd., 1967.

The current consumption rates of nickel and iron are mainly functions of local standards of living and of the relative abundance of these metals. Because of its abundance which results in a low price, the consumption of iron is high on a per capita basis, being 250 pounds per person as an average for the world and 1,200 pounds per person in the United States. Nickel would be used to a far greater extent than now occurs as a substitute for iron and as an alloying agent to be used with iron in order to take advantage of such metallurgical characteristics of nickel as its corrosion resistance if nickel were a much more common metal. The average consumption of nickel for the world is 0.35 pounds per person. For the United States alone, the comparable figure is 1.6 pounds per person. Suppose that the nickel supply was to increase drastically and the price of nickel amounted to about twice that of iron. Gaffey and McCord estimate that the market for nickel would become a tenth of the market for iron or greater.[11]

The determination of the consumption rate of iron at some time in the future is a function of certain assumptions. These assumptions deal with population patterns, living standards, and the technologies of mining and recycling. Gaffey and McCord assume that growth in iron consumption arising from population growth would be accompanied by a significant rise in the proportion of iron and steel being recycled through the industrial-societal-environmental system. The same would be true for iron consumption growth arising from an increase in the average global standard of living. In the relatively near future, this recycling would be expected to keep the consumption of new iron at the present level.[11]

The future price structure for new iron will be a function of the cost of producing new iron. This cost consists of both capital costs and operating costs. Capital costs are those expended for expanding, maintaining, and replacing plant facilities for the completion of actual processing. Operating costs are those expended for mining, transporting and smelting the ore. The total costs of plant facilities depend upon labor and interest costs. In turn, plant facilities costs help to determine the rate of inflation and the cost of living.[11]

Mining, transporting, and smelting are energy-intensive activities. This means that the operating costs of these activities are functions of energy costs. In order to smelt a given quantity of iron ore, one and a half times that quantity of coke is needed. High grade iron ore is being exhausted. This means that the average grade of all iron ore is decreasing. The necessity of working with low grade ores has a number of negative consequencies. In order to obtain a given amount of iron, a greater volume of iron ore will have to be processed. More concentration steps will be required. Much more waste will have to be handled. Vigorous action will have to be taken to nullify the increased pollution. More land will be disrupted and then have to be restored. With regard to a typical energy source used in iron production, such as coal, similar negative consequences will develop. For example, as coal seems near the surface of the earth are exhausted seams deeper within the crust will have to be utilized and the environment will be increasingly disrupted on this account. How new energy sources such as thermonuclear fusion power plants and satellite solar power stations would affect matters is uncertain. Upon adding up the results of all of these negative consequencies Gaffey and McCord conclude that the rate of rise in the operating costs for producing new iron is expected to be equal to or greater than the inflation rate.[11]

In order to obtain the sale price of iron at some point of future time, it is necessary to integrate the various capital costs and operating costs as part of a coherent sale price. Gaffey and McCord do this. Under the most optimistic scenario, from the point of view of an iron purchaser, the sale price will stay at no less than a constant uninflated value in dollars. It is more likely, however, that this price will rise by fifty percent to two hundred percent. For the purposes of their analysis, Gaffey and McCord assume that the price will double relative to 1975 dollars. It is not clear from their study just within what period of time they envisage this doubling to occur since they do not explicitly give a time span. From the context of their entire discussion of the utilization of extra-terrestrial natural resources it becomes evident that the period of time under consideration is in the time frame of roughly between the years 2000 and 2020. (In the absence of extra-terrestrial natural resources utilization of doubling of the sale price that they estimate would turn out to be far smaller than would occur in reality.) The last assumption in their analysis is that the delivery of new extra-terrestrial iron is limited by physical constraints to only one half of the new iron demand and that the extra-terrestrial nickel delivered is equal to the entire new nickel demand.[11]

The final estimate is that extra-terrestrial iron deliveries to the earth would provide an annual return of one hundred billion dollars per year. Extra-terrestrial nickel deliveries would yield a return of forty billion dollars per year. Hence, the total return would amount to one hundred forty billion dollars per year. The

amount of iron delivered per year would be six hundred fifty thousand metric tons. The amount of nickel delivered per year would be one hundred thirty five thousand metric tons.[11]

In terms of environmental impact and politics, extra-terrestrial natural resources delivered to the earth would provide major benefits to the United States.

In 1972, 450 million metric tons of coal was needed in order to obtain iron by smelting 750 million metric tons of iron ore. This amount of coal constituted fifteen percent of the total global production of coal for that year.[11] [17] The ratio of coal used to iron ore smelted was then about 0.6:1.0 in 1972. The less rich the ore is in iron content, the higher this ratio becomes. In the case of more recently developed iron ore deposits, the ratio is approximately 1:1. This is true of Iron Mountain in Australia. The ratio is approximately 2.5:1 for districts that have been mined for a long period of time. This is true of the Mesabi Range in Minnesota.[11] [18] The explanation for this shift in ratio arises from the study of the origin of iron ore bodies. Such bodies develop from the weathering of rock having an iron content varying from five percent to fifteen percent. This weathering has a concentration effect. The result is the production of thick surface layers of iron oxides which layers contain sixty five percent iron. The layers beneath the surface layers are less weathered and consequently less rich in iron. Unweathered rock is eventually found at a great enough depth. When iron is strip mined, the surface layers are excavated first. Eventually, these layers are exhausted. It is then necessary to mine successively lower layers which layers have a lower iron content than the surface layers. The iron oxide content of the poorer grade ores must be separated out and concentrated. An example of this is the Lake Superior district. The ore her is taconite. The average iron content of this ore which iron is recoverable is 24.4 percent. In 1972, the mining of taconite yielded seventy one percent of the iron ore mined in the United States. The taconite operations also produce 1.5 tons of waste for each ton of ore pulled from the ground.

The mining operations that are required in order to obtain the necessary ores and fuels are responsible for a major portion of the environmental impact of iron production.[11] The utilization of lower grade iron ore means that more of this ore must be excavated so as to procure the same amount of iron as when higher grade ore is used. More energy must be used so that the phases containing iron are concentrated. Lower grade ore also means that it is necessary to handle an increased amount of waste. There are then two basic choices to be made. If no money is spent to prevent damage to the environment, then society pays a price by allowing the environmental degradation to occur. If money is expended to prevent environmental damage, the society pays a financial price. The cost in either case, environmental price or financial price, rises significantly as the grade of the ore diminishes. Environmental degradation means a lowering of the quality of life. Negation and/or prevention of environmental degradation means a rise in the cost of materials. In real life, it is possible to windup with both a lessened quality of life and more expensive materials.

The acquisition of the coals used to reduce the iron ore, leads to similar difficulties. In the process of mining, the big shallow, conveniently excavated depositis are consumed. As time passes, the seams that are dealt with are less thick and are found at a greater depth. The tunnels required to mine the deep seams are more costly to dig in terms of money and more costly to operate in terms of human lives. If instead of deep tunnels, stripping of the land is required, then more land must be stripped in order to obtain the same amout of coal.

It should be noted that both B'nai B'rith and Gaffey and McCord are not stating that the extra-terrestrial environment option for the procurement of natural resources should be considered now because terrestrial sources are in imminent danger of being exhausted. Terrestrial sources are not in such danger and the DPS-PCC study agrees with this point of view. For example, the known global coal reserves could last for about two thousand years and the known global iron reserves could last for many thousands of years at their respective current rates of consumption. However, the costs, both financial and environmental, rise as increasingly lower grades of ores are utilized. For materials which occur in abundance in the extra-terrestrial environment these costs are avoided.[11]

Consequently, it is seen that from the points of view of the environment, economics, and international politics it is definitely in the best interests of the United States to acquire and utilize the natural resources of the extra-terrestrial environment to the greatest possible extent as expeditiously as possible. It should not allow

---

[17] Sheridan, E. T. "Coke and coal chemicals" in "Minerals Yearbook (I) U.S. Bureau of Mines", 1973, p. 413.

[18] Klinges, F. L. "Iron Ore" in "Mineral Yearbook (I) U.S. Bureau of Mines," 1973, p. 609.

itself to be hampered in the area of the development and utilization of extra-terrestrial natural resources.

The mining and processing of crude ores in space requires energy. One possible source of energy is the radiant energy of the sun. It could be feasible to use solar energy out to the orbit of the planet Jupiter for most of the mining and processing operations. The utilization of solar energy in the extra-terrestrial environment would lessen the demand for energy on the earth. This utilization would decrease the amount of pollution generated on the earth.[11]

It has been determined by the use of remote sensing techniques that substances similar to iron meteorites, stony-iron meteorites, and ordinary chondrites can be found in asteroids located in the main asteroid belt or asteroids of the Apollo group.[11] (The Apollo asteroids have orbits whose perihelia lie within the orbit of the earth. One of these asteroids, Icarus, has an orbit taking it closer to the sun than the planet Mercury. There are about two dozen Apollo asteroids now known to exist and the total number existing may be a thousand.[19])

Unlike the other sources, ordinary chondritic substances will require the utilization of some means of concentrating the iron-nickel-cobalt phase.[11] This concentration can be performed by crushing the material and extracting the metallic substances magnetically from a stream of the pulverized substances in a ballistic trajectory.[11] The metallic minerals can be processed by being passed into one side of a heated insulated cavity and being withdrawn at the other side in the form of metallic bars. The cavity would be heated by a large mirror that would focus the light of the sun on the aperture of the cavity. Using the 1400 joules per square meter incident on a surface situated at the same distance as the earth is from the sun, a facility at that distance from the sun could melt about 150 metric tons of iron-nickel-cobalt material per square meter of mirror area per year. A zone refining technique could be used so that as a molten bar of metal traverses the cavity, it passes through a series of cooling regions. Just before entering the cooling region, a fraction of the liquid metal is withdrawn. The end result of this refining would be iron with less than five percent nickel, nickel alloy with a nickel content greater than seventy percent, and a cobalt alloy. The cobalt alloy would contain copper and a majority of the siderophilic elements found in the original minerals. Another possible refining process is vapor fractionation.[20] In a zero or low gravity environment it is feasible to use such fabrication techniques as the production of metal foam by injecting a gas phase into the molten metal in order to obtain a metal foam. The entire process of getting metal from the ore state to its fabricated form it is anticipated does not pose any unreasonable difficulties. All of the processing would occur in the extra-terrestrial environment.

Gaffey and McCord[11] believe that the main technical points to be addressed in their proposal are the means by which material is conveyed from some point in the solar system to the vicinity of the earth and thence to the surface of the earth. The means of conveyance they consider are ones that are currently within or that could soon be within the technological grasp of the United States. The means of transport should have no adverse impact upon the environment.

An estimate of the energy required to change the original orbit of an asteroid into a minimum energy Hohmann transfer orbit which transfer orbit is tangent to the orbit of the earth and then to change the transfer orbit into a circular orbit having a radius of one astronomical unit can be obtained in terms of an impulse velocity change.[11] For the Apollo asteroids the velocity change required to move one of these bodies into a transfer orbit varies from about 3 km/sec to about 10 km/sec. The corresponding figure for main belt asteriods is about 4 km/sec to about 6 km/sec. The velocity change needed for the conversion from a transfer orbit to a circular orbit for the Apollo asteriods varies from about 1 km/sec to about 4 km/sec. The corresponding figure for the belt asteriods is about 4 km/sec to about 6 km/sec. The total change in velocity required for the Apollo asteriods varies from about 4 km/sec to about 14 km/sec. The corresponding figure for the belt asteriods is about 8 km/sec to about 12 km/sec. It is assumed that the orbits are co-planar. These should be a large number of asteriods satisfying this co-planar condition.

Gaffey and McCord[11] consider a number of possible ways by which the required velocity changes can be accomplished. One possible approach is to use standard chemical rockets with fuel, such as hydrocarbons and hydrogen, supplied from the earth. This approach suffers from the deficiencies of having a very low specific

---

[19] Pasachoff, Jay, M. and Kutner, Marc L. University Astronomy. Philadelphia, London, and Toronto; W. B. Saunders Company, 1978.

[20] Drexler, K. E. and Henson, H. K. "Design of equipment for vapor processing of metals". Abstract submitted to Seventh Lunar Science Conference, Special Session on Utilization of Lunar Materials and Expertise for Large Scale Operations in Space. Houston, Texas. March 15–18, 1976.

impulse and a very poor mass ration. It is, thus, a limited way to achieve the desired velocity changes and would be suitable only for small scale applications.

A somewhat more appealing possibility is the use of the heat of a nuclear fission reactor to expel hydrogen or some other low atomic weight reduction mass material. The reaction mass would be brought from the earth. Although the specific impulse of from 600 sec to 1000 sec is greater than that for a chemical rocket, the application of this approach would still be limited.

Gaffey and McCord neglect the possibility of utilizing low atomic weight reaction mass obtained from the atomospher of Jupiter or some other suitable gas giant planet. Within the context of the maximum utilization of the extraterrestrial environment for the support of all extra-terrestrial activities, the procurement of reaction mass from planetary atmospheres could lead to significant economies in extra-terrestrial mining activities.

The utilization of a nuclear fusion reactor to heat, vaporize, and expel any available material, such as silicate rock minerals, would result in a rocket having a specific impulse ranging from 500 sec to 10,000 sec, to exact value of the specific impulse being a function of the operating temperature and the atomic weight of the reaction mass.[11] Although the required thermonuclear fusion technology does not yet exist, this technology could be developed readily by the end of the twentieth century as part of the ongoing research and development effort in the area of thermonuclear fusion technology. Such a development would be of considerable importance for extra-terrestrial mining.

The utilization of the nuclear impulse technique is another way of moving asteroids.[11 21 22 23] In the ablative mode, this technique means that a nuclear device is detonated in the vicinity of the surface of an asteroid of appropriate size. The distance from the surface would be about 100 meters. The diameter of the asteroid could vary from 1 km to 10 km. The detonation would create a plasma crater and a plasma jet would rise away from the surface of the asteroid, in effect making the asteroid into its own rocket engine. The specific impulse could range from about 2000 sec to 4000 sec. A possible disadvantage to this approach could be the creation of radioactive waste products on the asteroid. Nonetheless, this does appear to be a viable means eventually for modifying the orbits of small asteroids.

The nuclear impulse technique can also be used in a non-ablative mode. In this mode, the explosion of a nuclear device produces a shockwave which shockwave impinges on a bumper plate. The plate is attached to whatever object it is desired to accelerate. Some experiments were performed to test the application of this non-ablative mode using non-nuclear explosives under the name of Project Orion. It would be possible to attain specific impulses in the range of 300,000 sec to 3,000,000 sec. The original thought was to apply this concept to the propulsion of very large space vessels, and it is equally possible to apply this concept to moving asteroids.

The ion rocket has already been demonstrated on-board vehicles in space. In this type of rocket, a readily ionizable material, such as cesium, produces ions which ions are accelerated by an electric field. The ion stream constitutes the rocket exhaust. Although the ion rocket can deliver specific impulses in the range of 5,000 sec to 10,000 sec, the systems that have been developed to date are capable only of yielding very low thrusts. Unless the ion current could be drastically increased, it appears that ion propulsion is limited to applications that could be satisfied by long duration of the propulsion period and low thrust.[11]

Another possibility for moving asteroids that is still in the concept stage and has not yet been developed is the charged particle rocket.[11] In this concept, grains of material of submicron size have an electrical charge placed upon them. For example, silicate grains can be photoionized. A suitable energy source would be required for this system, most likely nuclear or solar. The thrust produced should be considerably greater than that produced by ion rockets. The anticipated specific impulse is in the range of 1,000 sec to 10,000 sec. If the charged particle rocket turns out to be feasible, it would probably have a wider range of application.

The transport linear accelerator which is also known as the electromagnetic mass driver is a concept that has already been developed on a small scale in the laboratory.[11 24] The mass driver is based upon the acceleration of small containers holding masses. The containers are held on a track by dynamic magnetic levitation and

---

[21] Kleiman, L. A. (editor). "Project Icarus—M.I.T. Report No. 13." Cambridge, Massachusetts; The M.I.T. Press, 1967.

[22] Nance, J. C. "Nuclear pulse propulsion" (presented at 11th Nuclear Science Symposium of the Institute of Electrical and Electronic Engineers, October 1964) in "I.E.E.E. Trans on Nuclear Science," volume NS-12, number 1, 1965, p. 177.

[23] Dyson, F. J. "Interstellar Transport" in Physics Today, volume 21, number 10, October 1968, p. 41.

[24] O'Neill, G. K. "The colonization of space" in Physics Today, volume 27, 1974, p. 32.

a linear synchronous motor. At the end of the track acceleration ceases and the buckets are brought to an abrupt stop by some mechanical means. The containers are made with an open top. Upon the cessation of the motion of an open bucket, the mass within continues on its way through the open top. The mass has the velocity which it has acquired as a result of the period of acceleration. The object, such as an asteriod, to which the mass driver is attached then undergoes a reaction impelling the object in the direction opposite that of the expelled mass. A considerable amount of technological development has already been attained through the application of linear synchronous motors to propel high-speed trains. The specific impulse obtained, in the range of 250 sec to 2,500 sec, is a function of the length and strength of the track. In order to obtain a reasonably high specific impulse, a track length of about 50 km is required. The mass driver is a low thrust device. Any material that fits into the buckets is suitable for use as reaction mass. A suitable energy source is required to power the driver.

Collisional impulse can be used to greatly magnify the effect of any of the reaction-type propulsion devices.[11] Suppose that it is desired to change the orbit of a large asteroid by a certain amount. No available reaction device or combination of such devices is sufficient to supply the requisite velocity change. Further, suppose that there does exist another, smaller asteroid which the rocket engines could push into a trajectory that causes the smaller asteroid to collide with the larger one in such a manner as to produce the required velocity change of the larger asteroid. This change in velocity upon impact is known as the collisional impulse technique for orbit modification.

A non-reaction device approach to orbit modification is based upon the interaction between the gravitational field of an asteroid and the corresponding field of a planetary mass.[11 25] The velocity change obtained is then a function of the mass of the planet and the closeness of the encounter between the asteroid and the planet. This gravitational assist trajectory technique has already been used to alter spacecraft trajectories by encounters with Jupiter or Venus.

In order to slow down smaller asteroids for the final phase of the retrieval process, if the terminal point is on a planet with an atmosphere such as the earth, then the atmospheric grazing technique could be used.[11] The asteroid would have to be structurally sound enough so as to maintain its structural integrity during the traversal of the atmosphere. The velocity change of the asteroid would be a function of the size, shape, and density of the asteroid and on the path it would traverse within the atmosphere. The velocity change would also depend on the velocity of the asteroid relative to the planet.

Yet another transportation mode is laser propulsion. Laser radiation impinging upon an asteroid vaporizes surface material. This vaporized material produces a jet directed away from the asteroidal surface.[11 26]

Among these various means for effecting changes in the velocity of an asteroid, those means are most attractive which involve the use of on-site asteroidal material as reaction mass.

Gaffey and McCord [11] consider the specific example of a vessel, essentially, an iron-nickel asteroid, having an original total mass of 125 million metric tons. Its original orbit is elliptical with the orbital semi-major axis being 2.5 astronomical units. The eccentricity of this orbit is 0.1 and the orbit is co-planar with that of the earth. The vessel is to be transferred to an orbit resonant with that of the earth. After the transfer, the orbit will be essentially the same as that of the earth at a distance of 1.0 astronomical unit from the sun with a geocentric distance of 60 earth radii. The first velocity change required over a time of 144 days is less than or equal to 5.2 km/sec. The second velocity change required over a time of 36 days is less than or equal to 5.3 km/sec. The exact velocity change figures are dependent upon the necessity of utilizing a Mars or earth gravity assist. Gaffey and McCord consider a number of different combinations of specific impulse, exhaust power, mass flow, and mass ratio for the trip. The case in which a specific impulse of 5,000 sec is used delivers the most amount of the mass of the original vessel to the vicinity of the earth as compared to the lesser specific impulses given. The first velocity change uses a power level of 13.0×10^{11} watts and a mass flow of 1,000 kg/sec. The mass ratio at the end of 144 days is 0.90. The second velocity change uses a power level of 4.7×10^{12} watts and a mass flow of 3,600 kg/sec. The ratio of the final mass of the asteroid to the mass of the asteroid in its original orbit is 0.80 after this 36-day period. With a market price of $440 per metric ton and a cargo mass of 80 million metric tons of nickel iron delivered, the trip is valued at about 35 billion dollars.

---

[25] Niehoff, J. C. "Gravity-assisted trajectories of solar-system targets" in Jour. Spacecraft and Rockets, volume 3, 1966, p. 1351.

[26] Kantrowitz, A. "Propulsion to orbit by groundbased lasers" in Astronautics and Aeronautics, volume 10, number 5, May 1972, p. 74.

The energy requirements for this asteroid moving is comparable with the energy required to produce iron metal from high-grade terrestrial ion ores, which ores are basically iron oxides, in blast furnaces. The energy consumed in the terrestrial process which comes from the burning of coal, coke, natural gas and/or petroleum products amounts to about $17 \times 10 - 6$ joules/kg. The direct energy requirements for asteroid moving vary from $5 \times 10 - 6$ joules/kg to $100 \times 10 - 6$ joules/kg, these requirements being a function of the original orbital parameters of the asteroid and the efficiency of the propulsion system.[11]

The second half of the technical problem of bringing in the natural resources of the asteroids, namely the acquisition of the material from earth orbit down to the surface of the earth, is also within or could soon be in the technological grasp of the United States.

It is assumed that an objective containing the resources is in a roughly circular orbit 60 earth radii from the earth.[11] The Moon could be used to provide a great deal of the velocity change required to get the object down to the surface of the earth through the use of the gravity assist technique.

The form and character with which the asteroidal material enters the atmosphere of the earth is of importance because of certain environmental and societal constraints.[11] Another constraint is imposed by the assumption that only atmospheric drag is used to bring the velocity of the object from orbital velocity to zero. There should be no destructive consequences arising from the entry into the atmospher, the traversal of the atmospher, and the landing. The terminal velocity should be low. The landing should occur in a safe area. The impact velocity should be low. Material release, especially release in the form of particles, into the atmosphere from the entry body should be kept small relative to the naturally occuring meteor flux. There should be no danger to people or to the environment at any time during the entry and traversal of the atmosphere and upon landing. There constraints mean that the nature and form of the material constituting the entry body must undergo considerable modification while it is still in the extra-terrestrial environment. Again, the production of this modification is no strain on the technology of this nation.

Three possible configurations for the entry body are the flattened shuttlecock, the lifting body, and the carât shape.[11] All of these configurations are inherently stable upon atmospheric entry with the center of mass of the body forward, in the direction of flight, of the center of figure of the object. Somewhere in the course of processing and fabricating the entry body, a volatile phase would be injected into the molten metal so that the entry body would be less dense than water. This would make a water landing very convenient. From the point of view of safety, this low density means that if the body should breakup during atmospheric entry and traversal the resulting pieces would have low terminal and impact velocities.

It is thus seen that from a number of points of view it is definitely not in the best interests of the United States of America for this nation to sign the MT. The motivations of many of the nations responsible for the framing of the MT are suspect. The United States cannot afford to get itself into any more situations similar to the situation that now exists with respect to petroleum and OPEC. The extra-terrestrial environment can provide a tremendous increase in the amount of natural resources available to the United States. The United States now has the science and technology to acquire and utilize these extra-terrestrial resources in the very near future. All that the United States currently lacks is the will to do so. B'nai B'rith fervently hopes that this nation will immediately remedy this lack.

Consider the MT itself. Several important terms in this document are vague and undefined. Such imprecision lead to the possibility of traps being sprung. A treaty is a contract. A contract is an agreement between parties to do or to abstain from doing some legal thing.[27] A treaty should thus be as clear and precise as possible in order to avoid conflicts over interpretation of the treaty by nations signatory to the treaty.

One example of imprecision in the MT is the undefined phrase "celestial bodies". A. Górbiel [28] of Poland has studied the text of the 1967 Outer Space Treaty (OST) in order to obtain a definition of the term "celestial bodies." The OST did not specify the scope of this concept in the legal sense, although the OST itself founded the basic factors of the international statute for celestial bodies. Without such specification, celestial bodies could be taken to mean anything, ranging from all astronomical objects occurring naturally regardless of their physical structures, distances

---

[27] Wyatt, John W. and Wyatt, Madie B. "Business Law: Principles and Cases" New York: McGraw-Hill Book Company, (fifth edition), 1975.

[28] Górbiel, A. "Reflections on the Concept of Celestial Bodies in International Law" in "Proceedings of the Twenty-Second Colloquium on the Law of Outer Space", September 16-22, 1979, Munich, Germany, American Institute of Aeronautics and Astronautics.

from earth, and sizes, to certain specific categories determined by a small number of characteristics.

One definition of celestial bodies is that they comprise only the planets of the solar system.[28] [29] This definition was later expanded to include the moons of the planets.[28] [29] [30]

Another definition is that celestial bodies are only those objects in the extra-terrestrial environment which cannot be moved from their natural orbits.[28] [31] This particular definition has a transparent difficulty in view of the proposal of Gaffey and McCord and the strides that science and technology can be anticipated to make as the future unfolds. As increasingly more powerful energy sources become available to humanity, it is reasonable to forsee the possibility that several centuries from now the planets themselves can be diverted from their courses.

Another definition is that an astronomical object is considered to be a celestial body if that body is capable of supporting a spacecraft which lands upon it.[28] [32] Again, this definition is a function on the available technology. A further refinement of this definition is that an astronomical object should have a specified size and a surface which is solid.[28] [33]

The definition of celestial bodies according to Górbiel[28] is that they constitute all of the astronomical objects found in nature or forms of substance found in the cosmos which if such objects or forms of substance are made use of by one entity or state prevents their utilization by the other entities or states. Górbiel feels that this definition would not place any obstacles in the way of the possible development and deployment of a satellite solar power station (SSPS) network to provide energy to the earth. However, he feels that such a definition would not allow it to be legally admissable for states to exploit industrially such forms of cosmic matter as the asteroids since the asteroids are an exhaustible resource although they are found in a very great quantity.

B'nai B'rith disagrees to a certain extent with the opinion of Górbiel. For example, in the long term the most economical way of constructing an SSPS network would be to use the natural resources of the extra-terrestrial environment such as the resources of the moon and the asteroids. If the United States should desire to construct an SSPS network, the Górbiel definition could be used to block this nation from fulfilling, in the most efficacious manner, its desire.

Further, the utilization of the asteriods by the United States along the lines of the proposal of Gaffey and McCord[11] and in a unilateral manner without any agreements with other states would not preclude those other states from using other asteroids independently of the United States. If the United States did have a significant technological advantage over any other nation and its requirements for extra-terrestrial natural resources constantly expanded, its activities would tend to exclude any possible activities by other nations. However, even without the enactment of any sort of regulatory international treaty, B'nai B'rith has confidence in the capacity of this nation to discipline itself and confidence in the basic morals and ethics of the United States so that other nations will get their fair due with respect to extra-terrestrial natural resources. Perhaps the best definition of a celestial body would be to simply define it to be any astronomical object.

Another undefined term in the MT is "common heritage of mankind" (CHM). In fact, the word "mankind" itself is not defined. Such phraseology as is represented by the common heritage of mankind is typical of the language used when the NIEO is discussed.

E. Fasan [34] has come to the conclusion that the word "mankind" in addition to its meaning as referring to the entirety of all human beings, i.e., the entirety of humanity, does have a special meaning in the context of space legal language. Fasan in turn refers to S. Gorove [35] as being the only authority to give this term a definitive meaning. Gorove feels that to use the word "mankind" in a legal sense it would have to acquire its exact meaning in accordance with its utilization in a given context.

---

[29] Cocca, A. A. "Basic Statute for the Moon and Celestial Bodies" in Revista di Dirotto Aero, volume 2, number 6, 1963, p. 141.

[30] Fasan, E. "Law and Peace for Celestial Bodies" in "Fifth Colloquium on the Law of Outer Space of the IISL," Varna, 1962, p. 8.

[31] Draft resolution adopted in 1964 by Working Group III of the Institute of Space Law.

[32] Gal, G. "Space Law." Leyden: A. W. Sijthoff and Dobbs Ferry, New York: Oceana Publications, 1969.

[33] Zhukov, G. P. "Kosmicheskoe Parvo." Moscow, 1966.

[34] Fasan, E. 'The Meaning Of The Term "Mankind" in Space Legal Language' in Journal of Space Law, volume 2, number 2, 1974, p. 125.

[35] Gorove, Stephen 'The Concept of "Common Heritage of Mankind": A Political, Moral or Legal Innovation' in San Diego Law Review, volume 9, number 3, May 1972, p. 390.

According to Gorove,[34] [35] mankind is a concept distinct from the concept of man in general. Mankind is a collective concept, referring to the body of people as a simple collection. Man in general refers to the individuals constituting that body. The implication to be derived from this distinction is that the rights of mankind are not synonymous with what have been termed human rights. Human rights are the rights of individuals. The rights of mankind would refer to the rights of a single particular collective entity. Gorove states that the time may have come for the law to develop a recognition of the rights, obligations, and interests of mankind in contrast to the rights, obligations, and interests of the nation state. Gorove even goes so far as to propose that a completely representative international entity be organized and endowed with the appropriate authority to act in the behalf of humanity.

Basing his views partly on the opinions of Gorove[35] and other authorities, Fasan[34] states that the word "mankind" is used to denote an entity which benefits from the exploration of space, that is the carrier of a domain and a heritage (whatever exactly that domain and that heritage may be designated as being), and that has envoys. Thus, Fasan arrives at the conclusion that "mankind" is a legal concept and that it is a legal subject of international law.

C. C. Christol[36] of the United States of America has made a thorough study of the CHM concept. Christol utilizes a functional approach in his analysis by endeavouring to ascertain the functions which the CHM fulfills and can fulfill in the future.

Christol commences his study with an examination of the CHM concept as it has been evolving in the course of working out international law for the utilization of the oceans of this world. B'nai B'rith believes that there is some danger in transferring the workings of international law in the oceanic domain to the workings of international law in the extra-terrestrial environment. Although there are some physical situations, parameters, and constraints common to both the oceanic and extra-terrestrial environments, there are basic distinctions and differences between the two domains. The oceanic environment is constrained to a portion of a single planet. Operations within that environment are dominated by the properties of that liquid substance. The extra-terrestrial environment is much more varied and the extent of the domain of that environment, namely the solar system, under consideration in the MT is so many orders of magnitude larger than the oceanic environment that this size difference is difficult for the mind to grasp. Operations within the atmosphere of the planet Jupiter would occur under very different conditions compared to operations dealing with asteroids in the asteroid belt. It is still pertinent and of considerable interest to consider the views of A. Pardo[37] which views Christol[36] has summarized.

Pardo had the oceanic environment in mind in his interpretation of the CHM concept. However, almost all of his interpretation is applicable to the extra-terrestrial environment. Pardo makes five basic points. The first point is that the CHM concept applies to a particular oceanic environment and to everything which that environment holds. The second point is that the CHM concept requires the founding of an administrative process. This process would assure that the benefits obtained from the resources of the particular oceanic environment would be utilized so that regardless of their conditions of wealth or of lack of wealth, all peoples would have their common advantage served. The third point is that the CHM concept requires that programs to protect that oceanic environment be instituted. These programs are to have the purpose of assuring that this environment and the resources within it will be maintained in an acceptable state for utilization by future generations. The fourth point is that the CHM concept requires that the environment and its resources be used only for peaceful purposes. The fifth point is that the CHM concept implies that all disputes and disagreements concerning the utilization and exploitation of the environment and its resources are to be resolved in a peaceful manner.

B'nai B'rith agrees with much of the five points of Pardo. However, B'nai B'rith has two points of its own to make with regard to the view of Pardo. One point is that the administraive process does not require that one international agency be established to the exclusion of the establishment of any other international, national, governmental, and/or non-governmental entities to utilize and exploit the resources of an environment, be the environment oceanic or extra-terrestrial. National operations by the United States could be carried out on a regular basis without

---

[36] Christol, Carl C. "The Legal Common Heritage of Mankind: Capturing An Illusive Concept And Applying It to World Needs" in Proceedings of the Eighteenth colloquium on the Law of Outer Space, International Institute of Space Law of the International Astronautical Federation, September 21–27, 1975, Lisbon, Portugal.

[37] Conversation between C. C. Christol and A. Pardo.

interfering in any manner with activities by an international agency. Ownership by the United States of various portions of the extra-terrestrial environment would not be in conflict with ownership of other portions of that environment by an international agency. B'nai B'rith believes strongly that the United States should appropriate and retain possession of those portions of the extra-terrestrial environment which could supply resources, services, and benefits which are desired and needed by this nation. The second point that B'nai B'rith feels must be made is that the United States must actively assert its legitimate needs in utilizing the extra-terrestrial environment and its resources for the defense of this nation. This utilization could range from the utilization of lunar and asteroidal material for the hardening of satellites against enemy attack to more active measures. Such action would not preclude the right of other nations to act in a similar manner. Further, any international entities operating within and utilizing the extra-terrestrial environment could utilize this environment and its resources for defense purposes. Indeed, any international agency which would be established whose object is partly or wholly involved with maintaining a watch on the peace of the world and/or taking more aggressive actions to maintain that peace should have the right and ability to use the extra-terrestrial environment and its resources to aid this agency in its operation. (United States Senator Adlai Stevenson has proposed the organization of an international reconnaissance system as an aid to the maintenance of global peace.) Nonetheless, the United States must retain the option and exercise it of using the extra-terrestrial environment and the resources of that environment for defense and military purposes because of the more or less permanent state of world affairs.

The relationship between the views of Pardo and the NIEO are apparent in the statement about the distribution of the benefits to be obtained from the resources found in the oceanic environment. Nowhere in the explanation of the views of Pardo as expressed by Christol is there any mention of what the individual members of the LDC group could do to earn their share of the benefits. B'nai B'rith does not believe that a nation should receive a share of the benefits from the exploitation of a natural resource just because that nation is in a more immature stage of development as compared to some other nation. There is much that a member of the LDC group could do to earn its share of benefits even if it is poor in the financial sense. In the long term, it does not help a member of the LDC group to attain maturity by simply being given benefits. In all likelihood this sort of situation where the LDC group member receives without giving would tend to hinder its development.

What could a member of the LDC group contribute to the development of the extra-terrestrial environment in order to justify its share of benefits from that environment? One possibility is that such a country could offer some of its land for use as a space vehicle launching and landing facility. The money to build this complex would come from one or more wealthier nations. Perhaps the financing could come from some special international agency. Much of the labor to build the facility could be provided by the LDC group member. If not enough of the citizens of this member have the requisite skills and education to participate in the construction and operations of the complex then the wealthier nations and/or the special international agency would provide appropriate educational facilities for the LDC group member on its own territory. Doubtless other ways could be found for this member of the LDC group to contribute to the utilization of the natural resources of the extra-terrestrial environment for its own benefit and the benefit of other nations.

The B'nai B'rith position concerning possession and sovereignty within the extra-terrestrial environment has some similarity to the res nullius concept which had been applied in ocean law before the rise of the CHM concept.[36] Under the concept of res nullius it was asserted that in certain areas of the ocean there was an absence of national sovereignty. Thus, nations had the right to exercise sovereignty over those areas.

Most of the surface area of the earth is covered by the oceans. Islands situated within the oceans do have national sovereignty exerted over them. For example, the Hawaiian Islands are actually now a part of the United States of America. It is even possible to consider the continents themselves to be situated within the oceans. Of course, it is a common everyday fact that nation states exert sovereignty over portions of continents. The seas themselves beyond a certain distance from the continents are generally regarded as not subject to national sovereignty. Ships of all nations are regarded as having free passage with regard to the high seas. By the phrase "the seas themselves," B'nai B'rith is referring to the actual water medium. B'nai B'rith believes that portions of the oceanic environment, such as portions of

the sea bottom, immersed within that water medium should be available for nations to exert sovereignty over them.

Similarly the moon can be regarded as a continent in the ocean of space and should be regarded as subject to national sovereignty as a whole or in part. Perhaps a reasonable compromise would be to regard a certain portion of the Moon as being an internationally controlled entity and have the remainder of the Moon subject to national sovereignty. National sovereignty could be exercised by one or separately by several nations over various subdivisions of the Moon. The right of a nation to exercise sovereignty and the size of its lunar domain could be determined by its ability to get to the Moon and to establish control of a more or less permanent nature over this particular geographical area of the Moon. In this manner the United States could be assured of getting its rightful share of lunar natural resources. Any other celestial body could be treated in the same manner. Space itself could be regarded as open of free passage by all nations and organizational entities.

Christol [36] has identified fourteen subconcepts which have contributed to the emergence of the CHM concept as a legal concept. He has obtained these subconcepts by looking at the CHM concept as a whole and then breaking down the concept into its components. If a number of authorities and/or people in general have agreed on the acceptance of a given component, then Christol accepts that component as forming part of the CHM concept. This component thus becomes a subconcept of the overall CHM concept. This approach to an analysis of the CHM concept does contain a certain amount of subjectiveness. It is possible that a large number of people would accept a certain idea or thought as being a component of the CHM concept and hence a subconcept. At the same time, another group of people would not consider the same idea or thought to be a component of the CHM concept and hence would reject having this idea or thought as a subconcept.

According to the analysis of Christol, then, the use of the term "mankind" or equivalent terms as a central pillar of the law of the extra-terrestrial environment is the first subconcept. The second subconcept is that the exploration and utilization of the extra-terrestrial environment is to be for peaceful purposes only.[36] This second subconcept is considered by Christol to be of standard acceptance in space law. However, a number of people believe, as does B'nai B'rith, that there are legitimate defense needs for which nations should be able to use the natural resources of the extra-terrestrial environment to satisfy.

The third subconcept is that one of the functions of space law is to formulate legal rights and principles in order to bring about international cooperation. The fourth subconcept is that national appropriation does not apply to the extra-terrestrial environment.[36] Again, B'nai B'rith among other people and groups, does not accept this fourth subconcept.

The fifth subconcept is the principle of openness. This subconcept includes the practice, applied more by the United States than by the Soviet Union, of making full public disclosures of knowledge relating to peaceful activities in the extra-terrestrial environment. The sixth subconcept is the duty of nation states to consult in a routine manner on the various matters relating to activities in the extra-terrestrial environment. An example of such matters is the regulation of radio frequencies utilized in space activities. The seventh subconcept is that it is in the best interests of mankind that the rights and duties of all of the entities engaging in activities in the extra-terrestrial environment should be respected. The eighth subconcept is that procedures now exist for the resolution of disputes arising from activities in the extra-terrestrial sphere.[36]

The ninth subconcept is that all of the parties that may benefit from exploration in the extra-terrestrial domain are to be treated in the same manner. B'nai B'rith and some other groups and people disagree with this equal treatment subconcept. Some consideration must be made of the resources the various parties put into exploration efforts. The tenth subconcept is that conservation is of aid to the present and future generations of mankind and that conservation must be practiced because physical resources are not without limits. The eleventh subconcept is that an international entity with sufficient governmental apparatus would be the means for obtaining the greatest benefit for mankind from the exploration and utilization of the extra-terrestrial environment.[36] Once more, B'nai B'rith and others find difficulty with accepting this eleventh subconcept and feel that it is subject to question.

Each nation state has its own jurisdictional sphere. The twelfth subconcept is that within its own jurisdictional sphere, a nation state is obligated to follow international standards. These are standards which have the objective of being of benefit to mankind. The thirteenth subconcept is that nuclear weapons or any other means of causing great amounts of ruin are not to be deployed in the extra-terrestrial environment. Such deployment would be detrimental to mankind. The fourteenth

and final subconcept is that the basic needs of mankind are to be forwarded through the compliance of nation states with a specific legal international duty. This duty is the pursuit of that behaviour leading to security and peace among the various nation states.[36]

The fourteen subconcepts of Christol show very much the influence of the NIEO, particularly in the neglect of the concepts of national sovereignty and appropriation.

The CHM concept, B'nai B'rith feels, is far too vague and dangerous a concept to be in a treaty which the United States is being requested to sign. It is dangerous partly because of its vagueness.

A treaty is only as good as its implementation. The implementation of a treaty depends upon the parties signatory to it. The LDC group is very largely responsible for the current shape and form of the MT. Recent history vividly demonstrates that the morals and ethics of a number of members of the LDC group are questionable. The events that have transpired in Vietnam and Cambodia demonstrate this point vividly. The Soviet Union has also had a great deal to do with the formulation of the MT. The activities of the Soviet Union in Afghanistan leave much to be desired. The MT is no better a document than could be expected from the behaviour of some of the nations which have shaped it.

B'nai B'rith believes that the proper development of the extra-terrestrial environment would occur if this development were shared by a number of national and international agencies and by a number of governmental and non-governmental entities. The right to possess property in the extra-terrestrial environment by national and international agencies and by governmental and non-governmental entities must be upheld. It is imperative that the MT be rejected by the United States of America.

M. S. McDougal, H. D. Lasswell, and I. A. Vlasic[38] have made a thorough study of resources in the extra-terrestrial environment. Their reasoning and conclusions have some similarity to those of B'nai B'rith. They categorize resources as being of three different types.

The three types of resources which McDougal, Lasswell, and Vlasic consider are spatial-extension resources, flow resources, and stock resources.[38 39]

By spatial-extension resources[38] is meant those resources which are characterized by their utility as media of communication and transportation. Examples of spatial-extension resources are the surfaces of land and ocean, airspace, and the space between astronomical objects. McDougal, Lasswell, and Vlasic note that the utilization of a spatial extension resource for one purpose does not have to interfere with its use for another purpose or lessen its productivity. Further, the more parties there are involved in utilizing a resource of this type, the greater the potential production would become. This leads them to conclude that as a general community policy a spatial-extension resource should be open for the inclusive enjoyment of all parties. If important flow or stock resources were intimately intertwined with the spatial-extension resources then this general community policy would have to be modified.

In their work, McDougal, Lasswell, and Vlasic take inclusive participation in processes and activities to mean pluralism with regard to both the numbers and types of participants involved in these processes and activities. Pluralism in this context comprises states and other organizations of territorial communities, governmental organizations of an international nature, regional groupings of states, parties, pressure groups, private organizations, and individual persons. It must also be possible to admit new forms of organizations into inclusive processes and activities which forms could involve supranational, public, and private participants.

A flow resource[38 39] is a resource such that as time passes different units of that resource become available for use. Flow resources are further divided into two types. One type of flow resources are those which are not significantly affected by human actions. The second type comprises those flow resources which are significantly affected by human actions. Examples of the first type are the water of the oceans, tides, and solar and other space radiations.

The second type of flow resource is further subdivided into those which have a critical zone and those which do not have a critical zone. If a critical zone exists, this means that there exists a certain range of rates of flow below which it is not possible to reduce the flow rate and then to increase it again in an economical manner under conditions which are presently foreseeable.

---

[38] McDougal, Myres S., Lasswell, Harold D., and Vlasic, Ivan A. "Law and Public Order in Space." New Haven and London: Yale University Press, 1963.

[39] Ciriacy-Wantrup, Siegfried von. "Resource Conservation: Economics and Policies. 1952.

McDougall, Lasswell, and Vlasic believe that the best course to follow with regard to the flow resoruces that are significantly influenced by human action would be to make them subject to organized inclusive use.

A stock resource [38] [39] is primarily characterized by the fact that as time passes its total physical quantity does not significantly increase. The most common type of stock resources are minerals. There are two types of stock resources. Abundant stock resources are those stock resources which exist in large enough quantities so as to accommodate the demands of the present and the foreseeable future. Scarce stock resources are those stock resources which do not exist in such a large quantity.

The decisive factor in deciding about allocation policy in terms of inclusive or exclusive use of an abundant stock resource would most likely be the quantity contained within any given supply reservoir relative to demand. The tentative presumption of McDougall, Lasswell, and Vlasic is that abundant stock resources should be subject to inclusive use. In terms of a mineral having a wide distribution in large quantities over the surface of a celestial body, that mineral should be made shareable.

In the case of scarce stock resources, the determination within community policy as to the shareability or non-shareability of these resources would be a function of the characteristics of the social context. Suppose that private investment capital to some extent is required in order to proceed with the development and utilization of a resource. Also, suppose that users of this resource, which users have an exclusive claim on the resources, can be induced to supply capital without other community interests being damaged. Under these circumstances, making scarce stock resources shareable might be the better way to work toward community goals.

In general, the question of the shareability of minerals could be answered differently on different celestial bodies. The answer would depend upon the various features of the context and in particular upon the quantities of the mineral available on the various celestial bodies. The shareability of a mineral could also be a function of time. Such a temporal dependence could occur if fluctuations in demand arising from such factors as the discovery of new uses of the mineral or improved substitutes for it would require a new determination as to whether the mineral is abundant or scarce.[38]

Independent of the classification of a stock resource as being abundant, if the resource is of a strategic character, then McDougall, Lasswell, and Vlasic recommend that this resource be declared shareable. A resource has a strategic character if it is of great importance to several potential users. One circumstance under which a resource would be strategic would occur when a number of factors in the situation make access to that resource essential to significant future activities upon the celestial body where the resource is found. Such a strategic resource could be exploited and utilized under the condition of organized inclusive use, wherein all of the users would be under the direction of some appropriate international organization which organization would have the capability of assigning a fair share to each party claiming a portion of the resource.[38]

In general, McDougall, Lasswell, and Vlasic emphatically state that the great bulk of the resources of the extra-terrestrial environment should be maintained open for the inclusive enjoyment and utilization by all parties and participants wishing to exercise such enjoyment and utilization.[38] The great bulk of such resources should not be subjected to exclusive acquisition. The major criticism which B'nai B'rith has of the MT is that the MT is designed to lead toward the creation of an international regime which would subject the natural resources of the extra-terrestrial environment to the exclusive control of that regime.

In conclusion, B'nai B'rith has analyzed the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies from a number of points of view. These points of view have ranged from an examination of the needs of less developed countries to an investigation of the feasibility of the exploitation and utilization of the natural resources of the extra-terrestrial environment in the near future. The analysis of this Agreement, more popularly known as the Moon Treaty (MT), has resulted in B'nai B'rith strongly and unequivocally stating that the United States of America must not become signatory to this document.

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.,
Washington, D.C., August 7, 1980.

Hon. ADLAI E. STEVENSON,
Chairman, Subcommittee on Science, Technology and Space, Committee on Commerce, Science and Transportation, U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: Enclosed is a statement of the views of the Aerospace Industries Association of America, Inc., concerning the Moon Treaty. It is hoped that it can be included in the record of your Subcommittee's hearings on the matter.

Thank you.

Yours very truly,

KARL G. HARR, Jr.

Enclosure.

STATEMENT OF THE AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

On behalf of the nation's major manufacturers of spacecraft, satellites and related components and equipment designed for exploration of space, the Aerospace Industries Association of America, Inc., welcomes this opportunity to state for the record its views on the proposed "Agreement Governing the Activities of States on the Moon and other Celestial Bodies".

We oppose signature and ratification of this Treaty until such time as principles protecting the participation of private industry in the exploration and exploitation of space resources can be clarified and embodied in the Treaty in a manner binding on all signatories.

If exploitation of potentially valuable space resources is to be pursued by private industry, the proper framework of legal certainty and clear statement of rights and entitlements must be established. It is not sufficient to defer settlement of these important particulars to a "later" negotiation. In our view, there must be established at the outset a sound basis for the commercial development of the resources of the moon and other celestial bodies.

The reasons for this assertion are self-evident in a free-enterprise society. Industry must have a reasonable basis for estimating the anticipated return on its investments in research and development. Government, too, must be able to estimate its costs in such matters. However, the language of the proposed Treaty, by inviting widely differing intepretations of such phrases as "the common heritage of mankind," promises no such concrete framework for planning future government/industry projects in space.

Quite the contrary. Although, as originally understood, the phrase "common heritage of mankind" was viewed as meaning simply that all nations were to be assured nondiscriminatory access to the resources of space, it has, as a practical matter, become synonomous with "common ownership in the minds of many nations. It is not clear from the Treaty which interpretation will hold.

Conceptually, at least, the principle of "common ownership" leads to the principle of "common control". To the extent that "common control," either in terms of active exploration or a veto of such exploration, places important decisions in these matters outside of the control of the United States, we would be ill-served by this Treaty. We should not forget that many of the signatory countries have a vested interest in the use of *their* mineral resources rather than those obtained from celestial bodies.

Expectations of "common control" can also be expected to have a significant impact on the subsequent development of an international regime governing exploitation of nearby bodies. Without a predictable legal regime which promises a favorable commercial investment climate, money will simply not be spent by industry on the early forms of research necessary to decide whether broad-scale projects are feasible. Such projects may therefore never come into being—to the detriment of all.

Another area of convern for our member companies is the possible lack of protection of intellectual property, such as patents, trade secrets and proprietary rights, under the proposed Treaty. Such phrases as "information on . . . the results of each mission, including scientific results . . . shall be furnished . . ." (Article V) and "all space vehicles, equipment facilities, stations and installations on the moon shall be open to other States Parties," (Article XV) raise fears of possible forfeitures of company secrets. Despite the occasional use of such phrases as "to the greatest extent feasible and practicable," we feel that the threat posed by the Treaty to essential confidentiality is grave enough to seriously inhibit industrial participation.

While we recognize that many years of effort have gone into the negotiation of this document, our misgivings are serious and persistent. We feel it is imperative that the groundrules for a body of actions which promises to span a period of

centuries be laid with utmost precision. Therefore, we would urge that prior to signature and ratification by the United States, the following set of principles be clearly embodied in the Treaty:

(*a*) The unilateral right of exploitation prior to the establishment of an international regime;

(*b*) The protection of the participants' intellectual property on a commercially acceptable basis;

(*c*) The reservation to the participant of a commercially acceptable portion of the benefit of its exploitation;

(*d*) The immediate undertaking to establish the international regime promptly; and,

(e) Clear limitations on the authority of the regime consistent with the foregoing and in accordance with principles which will protect the commercial investment and participation of private enterprise in the exploitation of the moon.

While partial renegotiation of the Treaty obviously will delay matters and irritate some of the parties involved, we feel this matter is to important to be done halfway. The United States has to much to lose and too little to gain.

NATIONAL ACADEMY OF SCIENCES,
OFFICE OF THE PRESIDENT,
Washington, D.C., August 11, 1980.

Hon. ADLAI E. STEVENSON,
Chairman, Subcommittee on Science, Technology, and Space Committee on Commerce, Science, and Transportation, U.S. Senate, Washington, D.C.

DEAR SENATOR STEVENSON: This is in response to your request to present testimony before the Subcommittee on the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies." I regret that my absence from Washington prevented me from providing views in person.

As was indicated in discussions between members of our staff, I feel that it would be premature at this time to submit definitive institutional views of the National Research Council (NRC) on the proposed treaty without first seeking the advice and views of its several institutional components that have an interest in the scientific and technological exploitation of resources in our solar system. In light of the heightened level of political interest in these considerations, as manifested by the prior actions of the United Nations in preparing this proposed international agreement, and the implications for related programs of scientific investigations and technological utilization of extraterrestrial resources, I have requested our space Science Board and our Space Applications Board to give more detailed consideration to the terms of the treaty. Since the shorter term exploitation of extraterrestrial areas is unlikely, I would respectfully urge that action by the United States government on the proposed treaty be deferred until more careful scrutiny has been given to its provisions by the scientific and technological community.

A preliminary review of the proposed treaty provisions indicates that it is not without merit. For example, one of its effects would be to promote and assure continued scientific research and access to additions made to the body of knowledge about space, a matter that the NRC considers desirable. As you may know, the NRC has had experience with another international agreement with parallel similarities to the proposed treaty, i.e., the Antarctic Treaty. While the National Science Foundation has responsibility for planning, funding and implementing U.S. scientific programs and support activities for Antarctica, the NRC's Polar Research Board participates in the formulation of recommendations and resolutions forwarded to the Foundation for consideration. This process is a function of the Board's liaison role between the U.S. polar scientific community and government and exercised through the Scientific Committee on Antarctic Research of the International Council of Scientific Unions. I should add that our experience has been that nongovernmental organizations provide useful and effective mechanisms for promoting research. The participants are largely independent of official national positions and can deal exclusively with scientific issues.

While the proposed "Moon Treaty" seems to satisfactorily address the question of the freedom to carry out scientific exploration of solar system bodies, a central issue is that of the development of resources, clearly a matter of potential importance for the application of scientific discoveries.

The moon does have resources, but insofar as we can tell it is unlikely to have high grade ore deposits because it lacks the hydrological and biological activities evidently necessary for the concentration of minerals on the earth. The recovery of minerals from the lunar soil might require 'strip mining' on an extensive, not to say vast, scale. Asteroids whose orbits cross the orbit of the earth present equally,

possibly more, likely sources of some minerals, since meterorites have been recovered that are largely iron and nickel in composition.

The provisions of the treaty raise the questions as to whether it would curtail opportunities for commercial space venture and private competition in future orbital undertakings, including recovery of minerals. While prohibition of space resources for military purposes is consistent with the concerns of the scientific community, there is a question of the meaning and interpretation of the treaty's asserted purpose to safeguard and develop space resources as the "common heritage of mankind." If at all possible, that phrase should not be permitted to bar the United States from access to such utilizable resources as the moon may yet be found to offer, much as it bids fair to do as the outcome of the Law of the Sea negotiations.

As you may know, the issue of development of natural resources in Antarctica, such as oil and gas deposits and the krill population, was deliberately not addressed in the provisions of the Antarctic Treaty. At the time, such development was not foreseen in the near future, and the parties determined that by concentrating first on gaining scientific knowledge about the area through mutual cooperation, they would be able to work together to formulate objectives and procedures for the development of natural resources, if such activity became more feasible at a later time.

While we are not able to provide specific answers to the questions raised in your letter about precursor studies, costs and timing, as no such studies have been carried out by this institution, the Environmental Studies Board is currently working on a feasibility study of the satellite power system concept. This idea involves using a satellite in geostationary oribit to convert solar energy to microwave energy for transmission to earth. One aspect of the study, specifically called for by Congressional action, is that of use of extraterrestrial materials in the construction of such a satellite. This project is scheduled for completion in July 1981, and we would be pleased to provide to you the findings and results of our study. I assure you that information developed by other components of the NRC also will be made available to you.

Thank you for the opportunity to comment on this important and significant matter.

Sincerely yours,

PHILIP HANDLER, *President.*

HAFFER & ALTERMAN,
ATTORNEYS AND COUNSELORS AT LAW,
Washington, D.C., September 2, 1980.

Senator ADLAI E. STEVENSON,
Chairman, Subcommittee on Science, Technology, and Space, Committee on Commerce, Science and Transportation, U.S. Senate, Washington, D.C.

DEAR SENATOR STEVENSON: I am enclosing for your Subcommittee's consideration in its study of the "Moon Treaty", and for inclusion in the Hearings held on July 29 and 31, 1980, which I was privileged to attend, a copy of my paper on "Commercial Space Activities Under the Moon Treaty".[1]

While I support signature and ratification of the Moon Treaty, I recognize that well motivated attorney's find the Treaty's wording so equivocal as to conclude that investment of private capital in space activities related to exploitation of the natural resources of the moon as not warranted; and that for this reason the United States should not become a Party to the Treaty. I believe such conclusions to be overreactions as the negotiated history does clarify the drafters' intentions. However, to assure that the construction found in the negotiated history is followed by all countries, I suggest that in the U.S. Government's signing of the Treaty and in the Senate's Resolution of Ratification there be set out an "understanding" of questioned Treaty provisions to accord with the clarification reflected in the negotiated history.

With respect to resort to the legislative history and to asserting reservations (although above recited as "understandings"), your attention is respectfully invited to Articles 19, 20 (pars. 4(b) and 5), 23, 31, and 32 of the Vienna Convention on the Law of Treaties. While the United States has not yet ratified the Treaty (it became effective on January 27, 1980), it is understood as reflecting customary international law.

---

[1] The copy is in the subcommittee files.

The enclosed paper was written for and will be presented at a Space Law Colloquium of the International Institute of Space Law in Tokyo the week of September 22, 1980.

Sincerely,

MARTIN MENTER.