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A BILL TO PROVIDE A STANDARD REFERENCE DATA SYSTEM

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HEARINGS BEFORE THE SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT OF THE COMMITTEE ON SCIENCE AND ASTRONAUTICS U.S. HOUSE OF REPRESENTATIVES

EIGHTY-NINTH CONGRESS

SECOND SESSION

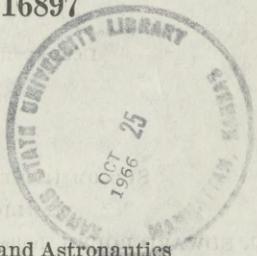
ON

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JUNE 28, 29, AND 30, 1966

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A BILL TO PROVIDE A STANDARD
REFERENCE DATA SYSTEM

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TO PROVIDE A STANDARD REFERENCE DATA SYSTEM
H.R. 15638 follows:
H.R. 15638, 80th Cong., 1st Sess.
A bill to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data.

A BILL TO PROVIDE A STANDARD REFERENCE DATA SYSTEM

TUESDAY, JUNE 28, 1966

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:15 a.m., in room 2325, Rayburn House Office Building, Hon. Emilio Q. Daddario (chairman of the subcommittee) presiding.

Mr. DADDARIO. This meeting will come to order.

We are happy to have as our first witness this morning Dr. Donald F. Hornig, who is the Director of the Office of Science and Technology. Today we begin hearings on H.R. 15638, a bill to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data.

This is an administration proposal which will set up a comprehensive Standard Reference Data System within the Department of Commerce to be administered by the National Bureau of Standards. This bill represents, to a degree, a continuation and expansion of work which is already going on within the Bureau of Standards.

Back in 1963 the Federal Council for Science and Technology, based upon the work of its Committee on Scientific Information, recommended the establishment of a National Standard Reference Data System within the Bureau of Standards, which was in fact created in June 1963 through the efforts of the Office of Science and Technology.

In essence, the program seeks to deal with one aspect of the broad science information problem by producing and disseminating compilations of critically evaluated, quantitative data on the physical and chemical properties of materials. It seeks to make data of known reliability conveniently available for use by scientists and engineers, thereby relieving them of the time-consuming necessity of searching the available literature and attempting to evaluate data in fields in which they may not be expert.

Dr. Hornig, we are always happy to have you here, and would like the benefit of your advice on the bill which is before us. We realize that you are not only the Director of the Office of Science and Technology, but also the Chairman of the Federal Council for Science and Technology, although I am not asking you to testify in that latter capacity.

(H.R. 15638 follows:)

[H.R. 15638, 89th Cong., 2d sess.]

A BILL To provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

DECLARATION OF POLICY

SECTION 1. The Congress hereby finds and declares that reliable standardized scientific and technical reference data are of vital importance to the progress of the Nation's science and technology. It is therefore the policy of the Congress to make critically evaluated reference data readily available to scientists, engineers, and the general public. It is the purpose of this Act to strengthen and enhance this policy.

DEFINITIONS

SEC. 2. For the purposes of this Act—

(a) The term "Standard Reference Data" means quantitative information, related to a measurable physical or chemical property of a substance or system of substances of known composition and structure, which is critically evaluated as to its reliability under section 3 of this Act.

(b) The term "Secretary" means the Secretary of Commerce.

SEC. 3. The Secretary is authorized and directed to provide or arrange for the collection, compilation, critical evaluation, publication, and dissemination of Standard Reference Data. In carrying out this program, the Secretary shall, to the maximum extent practicable, utilize the reference data services and facilities of other agencies and instrumentalities of the Federal Government and of State and local governments, persons, firms, institutions, and associations, with their consent and in such a manner as to avoid duplication of those services and facilities. All agencies and instrumentalities of the Federal Government are encouraged to exercise their duties and functions in such manner as will assist in carrying out the purpose of this Act. This section shall be deemed complementary to existing authority, and nothing herein is intended to repeal, supersede, or diminish existing authority or responsibility of any agency or instrumentality of the Federal Government.

SEC. 4. To provide for more effective integration and coordination of Standard Reference Data activities, the Secretary, in consultation with other interested Federal agencies, shall prescribe and publish in the Federal Register such standards, criteria, and procedures of the preparation and publication of Standard Reference Data as may be necessary to carry out the provisions of this Act.

SEC. 5. Standard Reference Data conforming to standards established by the Secretary may be published by the Secretary or by a person or agency designated by him without regard to the provision of section 11 of the Act of May 1, 1919 (ch. 86, 40 Stat. 1270; 44 U.S.C. 111), and may be sold by the Secretary or a person or agency designated by him at a price established without regard to the provisions of section 1 of the Act of May 11, 1922 (ch. 189, 42 Stat. 541; 44 U.S.C. 72), as amended, and section 307 of the Act of June 30, 1932 (ch. 314, 47 Stat. 409; 44 U.S.C. 72a). To the extent practicable and appropriate, such prices may reflect the cost of collection, compilation, evaluation, publication, or dissemination of such data, including administrative expenses and shall be subject to the Act of March 3, 1901 (ch. 872, 31 Stat. 1449; 15 U.S.C. 271-278e), as amended.

SEC. 6. The Secretary of Commerce shall adopt a symbol or mark which he may use, or may authorize to be used, in connection with the term "Standard Reference Data" on the data compilations provided for in this Act. Such symbol or mark shall be published in the Federal Register upon adoption.

SEC. 7. No person shall, without prior written authorization from the Secretary or his designee—

(a) use the Standard Reference Data symbol or mark adopted pursuant to section 6 of this Act or any colorable imitation thereof, or

(b) copy any data compilation bearing the Standard Reference Data symbol or mark adopted pursuant to section 6 of this Act.

SEC. 8. (a) Whoever violates any provision of section 7 of this Act shall be subject to a civil penalty by the Secretary of not to exceed \$100 for each such violation. As used in this subsection, the phrase "each such violation" means each copy of a publication which violates any provision of section 7 of this Act.

(b) Any such civil penalty may be compromised by the Secretary. The amount of such penalty, when finally determined, as the amount agreed upon in compromise, may be deducted from any sum owing by the United States to the person charged.

SEC. 9. (a) The United States district courts shall have jurisdiction to prevent and restrain violations of this Act. Upon request of the Secretary, the Attorney General on behalf of the United States may institute proceedings to prevent and restrain such violation. Action may be brought where the violation occurs, where any defendant may be found, or where any defendant resides. In any such action, the summons and complaint, and subpoenas for witnesses, shall be served as provided in the Federal Rules of Civil Procedure except that delivery of a summons and complaint may be made by certified mail beyond the territorial limitations of the district of the State in which the action is brought.

(b) In all injunction proceedings for the enforcement or to restrain violations of this Act, subpoenas for witnesses who are required to attend a court of the United States in any district may run into any other district in any such proceeding.

SEC. 10. There are authorized to be appropriated such amounts as may be needed for the purpose of this Act.

SEC. 11. This Act may be cited as the Standard Reference Data Act.

STATEMENT OF DR. DONALD F. HORNIG, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY

Dr. HORNIG. Mr. Chairman and members of the subcommittee, it is always a pleasure to appear before this committee.

Today's session is an opportunity for me to address a subject which I consider to be of national importance and very directly relevant to my job of coordinating Federal activities in science and technology, and assuring that science and technology are used most effectively in the interests of the national welfare.

I greatly appreciate this opportunity to discuss H.R. 15638 in the context of the Standard Reference Data System. My remarks will be addressed to the Standard Reference Data System itself, and secondly, to the relationship of that data system to the total national scientific and technical information program.

With respect to the Standard Reference Data System, let me first identify what is meant by the term "standard reference data." In the course of research, development, and testing, many measurements are made. These measurements describe the properties of matter—the mechanical properties of materials, the masses of atoms, the rates of chemical reactions, the wavelengths of light in emission spectra, and many others.

These measurements are then recorded and published in the scientific and technical literature for others to use. It is essential for the efficient conduct of the national research and development program that measurements of this sort published in widely separated places, be collected and made available to the roughly 2 million scientists and engineers employed in the research and development effort.

They need ready access to this data in their day-to-day work of research and designing components, selecting materials, and building systems, from space vehicles to oil refining. Failure to find data which the user can trust—now, I emphasize this phrase "which the user can

trust"—results in either rerunning experiments to establish the data, overdesign of components, faulty and wasted products, or abandonment of the effort.

The collection and evaluation of measurement data from the literature is so important that many of our large industrial concerns and our Government laboratories have for years maintained their own groups of highly skilled scientists and engineers to produce compilations of measurement data for the use of the laboratory or firms on research and development effort. In many cases these compilations find their way into the general public use, but in many other cases they remain of proprietary interest.

As you will hear in subsequent testimony, this is not a new subject. The establishment of critical tables is a long-standing national and indeed continuing international activity. I have some examples with me to show the committee the kind of thing that is put out. This is the last edition of the International Critical Tables, compiled in 1929. And this is as you see compilations of numbers. The original numbers appeared in scientific papers, because they were measured one at a time in the course of elaborate research.

To find the measurements in the original literature would take a lot of work on the part of an engineer or scientist, but by using these tables, he finds the numbers all compiled where he can have ready access to them.

Mr. DADDARIO. What does it cost to buy that book?

Dr. HORNIG. I am afraid I don't know the cost of the International Critical Tables volumes. I don't think it is in print any longer. I know libraries have it. I am not sure you can buy it. But perhaps Dr. Astin can answer that for you.

Mr. CONABLE. Is the information still accurate?

Dr. HORNIG. Oh, no. That is—some of it is, and some of it isn't. I can tell you from firsthand experience that this is always one of the problems. You look things up under International Critical Tables and the last reference is in the 1920's and yet almost all the researching in the world has been done since 1920.

Mr. DADDARIO. That gets back to the point "data that the user can trust."

Dr. HORNIG. Precisely.

Another example I have here. This is a compilation of data on the structure of crystals, which is published by the American Crystallographic Association.

Mr. CONABLE. The deterioration of this information as further research continues is likely to be a matter for the future as well as for the past, is it not?

Dr. HORNIG. Yes; this is why it is important to have a continuing activity, and the reason the Critical Tables ran out of gas is that the amount to be published and collected got to be too big for their staff and finances and they simply couldn't continue it any more.

And we are not the only ones. I have here a Russian compilation of thermodynamic data. They have a Russian publication program in the same area. It is not much use for people like me who don't read Russian. And this is a Department of Commerce publication on atomic transition probabilities. It is typical of the kind of thing that comes out of the Department of Commerce.

Now these things have to be updated constantly. It is important.

Mr. DADDARIO. You refer to the Russian data book, Dr. Hornig. Do the Russians do a better job keeping the data current, considering the cost and the difficulties involved in compiling the data?

Dr. HORNIG. I am not acquainted in great detail with their effort, but my impression is "No." I am not specifically aware, but through their large information dissemination system which you know about—I know they have a very considerable effort. But I am afraid I have not investigated the exact relationships of their standard data program to our own.

I should mention that besides these examples of what you might call primary data compilations every scientist and engineer has on his bookshelf various secondary compilations, such as handbooks. For instance, I have a thing called the "Handbook of Chemistry and Physics." Now the publishers of this book don't go back to the primary sources, and do critical evaluations. They use these primary sources to put together these secondary data compilations which contain extracted data and which is presumed to be useful to a particular class of scientist or engineer. This is because if you try to get the whole data collection together you have many volumes, even when it is compiled.

Now you might ask the question: "With all the indicated effort, both within and outside of the Government, why do we need a Standard Reference Data Program under the management of the National Bureau of Standards?"

The primary reason is that no one group has undertaken to assess the total standard reference data needs of the national research and development community and to insure that these needs are being met. In many areas of science and technology, there is an adequate effort, and there is considerable suspicion that there is some duplicative effort, especially in the private sector.

In other areas of science and technology, we know that the compilation of standard reference data is woefully inadequate, and yet no group feels a responsibility or obligation to remedy this lack.

The second important reason is that the methods of making such information readily available have been overtaken by the advance of technology itself. Three factors have caused serious difficulties: the increased complexity of the field of science and technology; the increased volume of scientific and technological information generated; the increase in volume and complexity of the use patterns of such data. I should add one other factor, that is, just the need to update constantly whatever has been done. Yet these same factors result in an intensified need for such data.

We are dealing, then, not with a brand new subject or activity, but rather with an aggravated situation of fragmented, dispersed effort and antiquation of methods. The task is to organize disparate efforts and apply modern techniques to an existing activity which is not being done well. Two questions naturally arise: How should it be done, or by whom, and at what level?

The preparation of standard reference data is no simple job. An exhaustive search of the published literature must be made, and where the evaluators know of unpublished information they must endeavor

to obtain it also. The various numbers for a given measurement must be weighed against each other, and a judgment rendered as to the probable best number and the probable accuracy of that value. This effort calls for scientific and engineering competence of the highest degree. Yet, because this type of effort only rarely leads to the discovery of new knowledge, there is a shortage of able scientists and engineers working in this field.

The problems of making standard reference data readily available have been accentuated by the increased complexity of science and technology itself. For example, the cost of making a measurement of the effective cross-section of a nucleus is in the order of \$100,000. Yet this information is essential for the efficient design of nuclear power reactors.

Measurements of nuclear cross-sections are being made in atomic energy installations around the world. The volume of information is steadily increasing, and is being published in more different languages.

Another complicating factor is the more diverse and more frequent use of standard reference data. The multidisciplinary teams working on many of our research and development projects today call for standard reference data from the most unexpected sources. Yet we have learned that this interdisciplinary approach is an exceedingly fruitful one.

This kind of a situation cries out for a closely coordinated program of governmental and private data collection, evaluation, compilation and dissemination efforts. This is what is being proposed as the Standard Reference Data System.

Because it was a matter which jointly concerned all of the Federal agencies involved in scientific and technical advance, the Federal Council for Science and Technology, as the subcommittee chairman noted, recommended in 1963 that the National Bureau of Standards be given the responsibility for a Government-wide program to develop critically evaluated or standard reference data in the physical sciences and technology and to insure its ready access for the benefit of the entire scientific and technical community in the United States.

This program was named the Standard Reference Data System, and was to be the primary means by which the Nation's scientists and engineers obtained the critically evaluated data which undergird modern science, technology, industry, and commerce. To meet the needs, new activities are required of the Department of Commerce and these are provided for in the Standard Reference Data Act.

The level of activity should be one which will result in a viable program; that is, one where the solutions or rate of improvement at least exceed the rate of growth of the problem or activity. The projections that the National Bureau of Standards has made, which you will hear about from them, to attain a fully operational level are consonant with my own experience in dealing with this kind of data and my feelings as to a viable level of effort.

It would take time to build to such a level due to organizing and staffing requirements and the limited number and availability of qualified people. The cost of such a program would be small compared to the research and development effort itself. In my judgment, it is still premature to decide that the Federal Government will operate at

least all of the information distribution part of the standard reference data system in all its aspects and forms. Perhaps the private publishing industry would be willing to undertake a large share of the information dissemination responsibility. Professional scientific and engineering societies may also wish to participate.

Mr. DADDARIO. Dr. Hornig, this question will come up from time to time and there will be different judgments. So we might as well ask you: You refer to the cost of such a program and the return as a result of it. Do you have any estimate as to this cost, and what its value would be in the final analysis?

Dr. HORNIG. Well, I think—

Mr. DADDARIO. The reason I ask is that we have heard a very small figure as to the cost and tremendous figures as to what the return will be. So it would be helpful to us if we can get some judgment from you on it.

Dr. HORNIG. I think you will have to get this in detail from Dr. Hollomon and Dr. Astin, but at the moment we are spending on the order of a couple of million dollars a year in this area. Since we are talking about the improvement in the national research and development effort which in the public and private sectors together is in excess of \$20 billion, I would think that a program of the order of \$10 to \$20 million at equilibrium would be a reasonable one, but this has to be based on detailed plans, so this is just to indicate a general order of magnitude.

The estimate of the return is a very, very hard one. What I know from personal experience, though, is that you simply can't carry on a research program without this data available and, therefore, our \$20 billion program can't proceed efficiently without this other effort. I believe the estimates that have been made were ranging from 10 to 1, to 100 to 1 and more, for the return per dollar invested. The reason it is so hard to estimate return, of course, is knowing "what would have been" is a problem. If I have the wrong number and I design a bad machine, this costs us money. But since I never have the machine I would have designed to compare with the machine I do design, this gets to be a judgment problem—there is a bit of guessing involved. But I think that the judgment that the returns are very great, since one is talking about an investment number which is a fraction of 1 percent of the total R. & D. effort, is certain to be true.

Mr. DADDARIO. You refer to the staffing requirement and the limited number of qualified people available. Do you believe that if this program is emphasized it will attract such people, or will they need to be trained and recruited specifically for this purpose?

Dr. HORNIG. Well, in general, the people who do this job will have to be practicing scientists at the same time. I don't think you can simply train a class of person to look at other people's numbers and work over their probable reliability and accuracy unless he is actively working himself in these fields.

I believe that the people are available within the scientific and technical community, but I think that it will take time to get the people and assemble them—they will have to be taken from, as I said, the practicing scientific field, and it will take time to get them acquainted with the special jobs of critically evaluating and compiling the data.

Mr. DADDARIO. We are not talking about new people, but about an extension of the use of their knowledge in a more efficient way?

Dr. HORNIG. I am talking about new people in the Bureau of Standards. I mean they will have to add to their staff. But it is not a new class of persons.

Mr. VIVIAN. Will the chairman yield?

Mr. DADDARIO. Yes, Mr. Vivian.

Mr. VIVIAN. Dr. Hornig, it seems to me that adding additional people to the Bureau of Standards to do this work might be one of the staler ways of doing the job. A much better approach would be to add a limited number of personnel to the Bureau of Standards, and carry on most of the specialized research in other institutions, whether it be nonprofit institutions, such as Battelle, or a university such as Cal Tech, which has done excellent work. In this way, the quality of the work is likely to be better because you change the people as the scope of the job begins to be completed.

Dr. HORNIG. I think there is no question that you are right. As I said, this work has to be done by practicing scientists and engineers, and the present pattern in the Bureau of Standards is to do it by contract in universities and in the nonprofit organizations to get data when it is available and it has been generated in industry, and I think every one of these sources should be used to the maximum practicable extent.

Mr. VIVIAN. So we would not interpret this \$20 million as all being spent internally in the Bureau of Standards?

Dr. HORNIG. I don't think it should be internal in NBS. The NBS has, of course, a key role in the United States in that it has been historically the center for very accurate determinations, so it has a tradition in this area which is very important in bringing together all the various elements you mentioned.

Mr. DADDARIO. Will you proceed, please?

Dr. HORNIG. Now, I understand you will be hearing from Drs. Holomon and Astin later, on the more detailed aspects of the plans and progress of the program at the National Bureau of Standards, so I would like to spend a few minutes on more related general problems.

The problem of standard reference data is part of the general question of the network of information systems in the whole of science and technology. The overall information problem has been a subject of considerable importance in the Office of Science and Technology for several years. It has resulted from the three factors mentioned above; namely, the increasing quantities of information generated out of the increased research and development efforts, the growing numbers of scientists and engineers, and the increasingly complex use of information for purposes far beyond those in the mind of the original investigator. Added to these should be the factor of mounting costs of information generation and processing.

The assurance of continued progress is dependent upon our ability to keep informed of past progress in terms of both successful and unsuccessful results and the ability to transfer results from one area of effort to other areas of effort. So we build information systems. National information systems constitutes not a new activity so much as an effort to get better organized and do a more effective job of information transfer in both the public and private sectors.

There has been considerable progress within the last year or two toward resolving these questions. A special task force of the Committee on Scientific and Technical Information of the Federal Council for Science and Technology last fall issued a report entitled "Recommendations for National Document Handling Systems in Science and Technology."

The essential recommendation of the report was that the Federal Government should make explicit its responsibility to insure that the significant worldwide scientific and technical literature is made readily accessible to all qualified individuals in the United States. All of this information may, in fact, already be here. If it is, however, we do not know it, nor can people find it if we do not know where it is. COSATT therefore recommended, also, that the Office of Science and Technology undertake the exploratory development of several national information systems in science and technology.

Recent planning in my office indicates that national systems will be constructed along a variety of lines, that is, some systems will be subject oriented, some process oriented, some mission oriented, and some by a combination of these and other dimensions. The Standard Reference Data System should be considered part of the total national network of scientific and technical information systems.

Four characteristics of national information systems, as we anticipate they may develop, are exemplified in the Standard Reference Data System. First, there is the need for minimizing the duplication of human effort both in the generation of data from research and development and in the handling of information resulting from this effort.

This principle of minimizing duplicate information derivation and processing, or conversely, capitalizing on human processing of information once performed, is a guiding one in our design of all the national scientific and technical information systems.

Second, national information systems will require the establishment of certain standards for quality and form. This will be vital to the Standard Reference Data System, which emphasizes data reliability.

Third, it is not expected that the Federal departments and agencies would operate the national information systems, although in some cases they might. The SRDS enlists the cooperation of all sectors of our scientific and technical community in the planning, support and operation of the system. I consider it to be very important to encourage and support the information-handling activities in the private sector.

I also consider it important to encourage the coordination of these efforts with governmental efforts in order to develop a more efficient and effective national network of information systems in science and technology. Fourth, the fixing of responsibility for the system in one Federal department focuses attention and effort on a specific set of objectives and activities.

This latter feature calls attention to an important aspect of national systems. The development and utilization of information and the nature of effective information systems which results, is no respecter of organizational demarcation lines drawn for good and sufficient but different purposes.

On the other hand, a national information system can be a means of tying together the widely separated and separately administered programs of the many governmental and private groups. By vesting responsibility for a national information system in a given area of science and technology in a single Federal department or agency, a long step forward will be taken toward more effective coordination of the Government-wide research and development effort.

I believe that the effective coordination and marshaling of Federal activities in a given information subject area generally will not require significant revision of present departmental statutory bases so much as it will require some special supplementary legislation which will reflect the intent of the Congress with respect to extra-departmental issues and opportunities. This is especially important with national information systems because they represent a coalition of both public and private activity and have a significant impact on all sectors.

The problem of national information systems is to recognize the motivation of mission-oriented departments and yet provide an effective managerial and fiscal mechanism by which measurable progress toward a national objective can be achieved.

We have much to learn about the building and operation of national information systems. My remarks have attempted to communicate to you what we have learned to date in this area and my conviction that legislation such as the proposed bill, H.R. 15638, is necessary, to articulate activities and provide focal points of responsibility and attention on national goals.

I believe that the realization of national information systems is one of the most challenging areas of current activity, with great potential impact on not only our science and technology but also on the academic, commercial, and industrial sectors of our society. I believe the Standard Reference Data System is an important beginning and that the enactment of H.R. 15638 will make it possible to realize its potential.

I will be pleased to answer any question, Mr. Chairman. Thank you.

Mr. DADDARIO. Thank you, Dr. Hornig.

I have a question that involves the idea that you express at the bottom of page 7. You say:

I consider it to be very important to encourage and support the information handling activities in the private sector.

Could you give this committee an idea as to what you mean, and how you think it might develop?

Dr. HORNIG. Well, for instance, and I am now speaking of information in general, rather than just the Standard Reference Data System, the chemical literature is published by the American Chemical Society. I don't know the exact count, but they publish some 15 or so different journals in various areas of chemistry.

In physics there is the American Physical Society that publishes the original literature. The American Biological Society publishes biological literature. The Engineering Society publishes engineering journals. So these are all private activities. In fact, the primary scientific literature publication is entirely in private hands. But they have great difficulties. There are many problems of coordination.

The most difficult one is—I mean information that is published in the chemical literature—how does it get into the hands of an engineer

who doesn't read the very specialized publications of the Chemical Society, for example. This is what produces the problem.

So we have very many journals, but most practicing engineers and very few scientists, even if they read 20 or 30 journals a month, can even dent the total amount of literature publication.

Then there are many inventions to deal with this. The Chemical Society, for example, publishes something called Chemical Abstracts. The Physical Society publishes Physics Abstracts. These are attempts to publish small abstracts of the journals and classify them by author, subject, and so on, so people can find them. Well, the number of abstracts gets so excessive that they then publish annual indexes to the abstracts.

They used to publish 10-year indexes to the indexes but now the volume of data has gotten so great that the Chemical Society has simply decided it can't publish any more decennial indexes. It is just overwhelmed. It can't afford it.

The question is they are giving up. So we are working together. There is now a program between the Science Foundation, the National Institutes of Health, the Department of the Army, and Chemical Abstracts to work on means of developing computerized ways of handling this information. So this is an example of Federal-private cooperation. This indexing is absolutely essential because otherwise the people who need it, who are the engineers, the people in industry, the people in universities, won't have access to the work we have paid quite a lot of money for.

Mr. DADDARIO. You see nothing in this bill which would bar the private sector from participating in this activity?

Dr. HORNIG. Oh, no. There are, of course, excellent examples in the past of the cooperation of the Bureau of Standards with the American Petroleum Institute in putting together critical data (thermodynamic data), the data on hydrocarbons. It was the Petroleum Institute which collected the standard samples of hydrocarbons from which the data were taken—that made the compilation. So there are many examples of cooperation.

Also in the sense that Mr. Vivian mentioned, where much of the data originates now in the first place in private laboratories, but which don't themselves compile data. So someone has to do something with it.

Of course, some of it they withhold for proprietary reasons, but much of it they are perfectly willing to put into standard manuals and cooperate, if there is only someone to do it.

Mr. DADDARIO. Dr. Hornig, when this committee first met and briefed itself on the aspects of this legislation, a question came up as to whether or not by compiling and making this information available, that the Government was also guaranteeing it. What are your thoughts on this?

Dr. HORNIG. I don't think so, except in a certain sense, as with a private activity, like when the International Critical Tables were put together, the authors said that this represents their best estimate of what is most reliable. They cite alternative values, or alternative sources.

I think this is the same responsibility the Bureau takes when it publishes something like this, with or without a mark. It says: "In our

judgment and according to our best people this is the most reliable thing you can find."

Now I have found myself in using such data in the past, that I don't always agree with the evaluator. Sometimes if it matters particularly to you, you can take the effort on a single number to go back and check yourself and see whether you have an independent judgment. So, of course, it takes a responsibility. This is what you mean by critically evaluated data. Someone has to be responsible for the critical evaluation and whoever was responsible has assumed a very serious responsibility.

But I don't think that the provision, for example, of a mark changes that responsibility, nor does it constitute a guarantee in any sense. Every scientist and engineer knows that many of the numbers he considered thoroughly reliable 10 years ago have changed. I don't think he is likely to be deceived.

Mr. DADDARIO. Dr. Hornig, on page 2 of your statement you say :

In many cases, these compilations find their way into the general public use, but in many other cases, they remain of proprietary interest.

Do you mean that they remain as a "proprietary interest" unintentionally?

Dr. HORNIG. Oh, no; not accidentally. I mean if I am in an industrial laboratory and I have developed a new alloy, for example, which I am using in some special way in my processes and have spent quite a lot of money characterizing it very precisely then I may consider it to be quite important not to disseminate it while it is of commercial value to me.

Mr. DADDARIO. It would seem to me that if this is a matter of proprietary interest, you would see to it that it would not get into a national system. Can you see anything particularly wrong with that?

Dr. HORNIG. That is right. But besides the ones that are withheld as a matter of proprietary interest there are many more which might, if there is a receiver, someone to talk to them, very well find their way into the public domain.

Mr. DADDARIO. Then you really mean that as the private sector develops information in this area, there is certain data which they would make available and there is other data of a proprietary interest which would not be made available.

Dr. HORNIG. That is correct. And there is also the intermediate case where one can get it, where they maintain it in proprietary form but are willing to give critical judgments on the basis of their experience as to the value of the data which you plan to publish. If I am in a private laboratory and I know the published data is wrong, I may tell you that, even if I am not willing to tell you what is right. And this may be very important to do just that much.

Mr. CONABLE. Mr. Chairman.

Mr. DADDARIO. Mr. Conable.

Mr. CONABLE. Following up this line of questioning, Dr. Hornig, I sent copies of this bill to some scientists in my area. One man who is a research scientist for General Dynamics, Mr. R. A. Santirocco, has written me a letter. I would like to read you a paragraph from it and ask your comment.

He says:

Section 7(b), restricting the "copying" of any Standard Reference Data compilation, needs clarification. The language of this section appears to contradict the well-established rule that Government publications cannot be copyrighted. The scientific community will, I assure you, be highly antipathetic to any statutory restrictions on free dissemination of the data.

Even more outrageous is Section 5, providing that Standard Reference Data "may be sold" by the Secretary of Commerce. Nothing could be more clearly in the public domain than scientific data, collected in most cases from the open scientific literature at public expense, by a non-Defense agency of the Federal Government. To the extent that any rights can exist in facts, these rights plainly reside in the people of the United States. The notion that the Secretary of Commerce can sell them is absurd. It must be deleted from any final version of the bill.

Will you comment on these remarks, sir?
(The complete letter follows:)

GENERAL DYNAMICS ELECTRONICS,
Rochester, June 21, 1966.

HON. BARBER B. CONABLE, Jr.,
House of Representatives,
Washington, D.C.

DEAR BARBER: I have read H.R. 15638 and the attached Commerce Department analysis with great interest.

The intent of the bill is probably good. Commerce has not overstated its case on the scientist's need for compilations of reliable reference data. I am not sure, however, that this bill will remedy the situation.

In particular, I question the "critical evaluation" function of the proposed Standard Reference Data project. The bill would set up elite panels, paid fat consulting fees, to evaluate the relative accuracy of the various data culled from the scientific literature. The processes of science, however, demand that the individual researcher make his own judgments, not that he rely on the packaged, "certified" opinions of anonymous, bureaucratically controlled expert panels. Science and the public will get the most for their money if the Standard Reference Data service concentrates solely on the production, and yearly updating, of comprehensive annotated bibliographies concerning the data in question.

Incidentally, there is a semantic pitfall in the word "standard." This word suggests something conventional, arrived at by mutual agreement. But the data we are considering are objective facts. Perhaps the word "standard" should be deleted everywhere in the bill.

I am shocked by the legal defects in the bill. Section 7(b), restricting the "copying" of any Standard Reference Data compilation, needs clarification. The language of this section appears to contradict the well-established rule that Government publications cannot be copyrighted. The scientific community will, I assure you, be highly antipathetic to any statutory restrictions on free dissemination of the data.

Even more outrageous is Section 5, providing that Standard Reference Data "may be sold" by the Secretary of Commerce. Nothing could be more clearly in the public domain than scientific data, collected in most cases from the open scientific literature at public expense, by a non-Defense agency of the Federal Government. To the extent that any rights can exist in facts, these rights plainly reside in the people of the United States. The notion that the Secretary of Commerce can sell them is absurd. It must be deleted from any final version of the bill.

In summary, I believe that scientists and engineers will be sympathetic to the aims of the bill, but that science and the public will benefit most if the bibliographic, rather than the critical, function is made paramount. However, few scientists, engineers, industries, or universities will support the bill with Sections 5 and 7(b) as they now stand.

I appreciate your thoughtfulness in soliciting my opinion, and I hope this has been of some service.

Sincerely,

R. A. SANTIROCCO,
Research Specialist, Special Programs Laboratory.

Dr. HORNIG. This question of user charges is a very difficult one. I think when Dr. Hollomon is here you should discuss with him the more detailed thoughts of the Bureau of Standards. I think the idea of charging for a number, if that were the question, would be absurd. But a good part of the expense resides in the effort to collect, compile, and set up special filing—I mean computer services and so on. It is my view that the use of reasonable user charges is one of the best ways of determining the value of services performed and that user charges as a concept does make sense under many circumstances.

There are the general compilations which one wants as widely disseminated as possible but there will be cases where special compilations in special areas have particularly value to particular groups. I think in such cases that user charges to me do make sense.

I think what I am saying is that if the bill said that there would be user charges for all compilations, this might be a justifiable criticism, but the bill doesn't say that. The bill allows user charges in appropriate circumstances.

Mr. CONABLE. This really is establishing a proprietary interest in the Government when any sort of user charge is allowed, is it not?

Dr. HORNIG. In a certain sense that is true. But you know when you establish computer services, for instance, one can set up enormously expensive systems for dissemination of information, and one of the problems is deciding what is really useful to people, what services are really useful, and which ones are nice, just desirable, and when they get expensive one of the best ways of finding out what people really want is what they are willing to pay for.

I think it then becomes a matter of more detailed policy, whether one charges full costs or charges enough so that one doesn't perform useless services so it has to be of some real value to the user if you are to perform this service.

Mr. CONABLE. That is all.

Mr. DADDARIO. We are happy to have the chairman of the full committee here. This is his bill, and he may have some questions?

Mr. MILLER. I have no questions, Mr. Chairman. I am very happy to see Dr. Hornig, and also Dr. Astin who is in the audience.

Mr. DADDARIO. We are happy to have them here too, Mr. Chairman.

Mr. Roush.

Mr. ROUSH. No questions, Mr. Chairman.

Mr. DADDARIO. Mr. Mosher.

Mr. MOSHER. Mr. Chairman, you earlier raised the question of what the costs would be and what the returns might be. Dr. Hornig indicated that this is very difficult to determine and that the returns might be 10 to 1 or 100 to 1. If I interpreted you correctly, Dr. Hornig, you indicated that regardless of what the returns may be, in your mind, this is an essential bill—almost an imperative thing to do.

Dr. HORNIG. I am not sure that the two are different. I do think it is essential, but I think it is essential because the returns are great.

Mr. MOSHER. I agree.

Dr. HORNIG. I don't think we could proceed with this enterprise without this data.

Mr. MOSHER. In other words, it isn't necessary to compute these returns with greater accuracy. In your mind they are so obviously

great that we should go ahead and do it. I am inclined to agree with this, and I am inclined to favor this type of legislation.

On the other hand, as a lay person, I feel vaguely uncomfortable. Perhaps we are creating a potential monster of some sort here. Is there any danger of getting into an authoritarian situation where a specified agency has a vested responsibility to say what is true and what is not true?

Dr. HORNIG. I understand the problem, sir. I think that the best answer to it is that there are many checks and balances built into the system. A number just doesn't appear in one of their publications as the established truth. As I said, it also appears in the original literature. The people who are using it have and can disseminate through many channels their own views if the Bureau in its publications were to be erroneous in its judgments. There are so many cross-checks or different ways in which information is both used and handled, this technical information, that I think the odds on anyone being able to make stick with the Government or anyone else an erroneous value for very long or to play good with respect to the correctness of data wouldn't stand up very long in the scientific and technical circles.

Mr. MOSHER. You don't see any danger that regardless of evidence that other people can produce, this agency will say: "Well, this is it"?

Dr. HORNIG. Well, on a smaller scale this has been in operation in the past and I have seen no evidence of such a complaint in actual operation in the past.

Mr. MOSHER. What are the implications when you use the word "standard" in this bill? Is standard reference data the same as critically evaluated data?

Dr. HORNIG. Essentially. It is data which meets certain standards of quality and reliability.

Mr. DADDARIO. Will the gentleman yield?

Dr. HORNIG. It has to be critically evaluated to determine whether it meets the standards of quality.

Mr. MOSHER. But the very fact that you use the word "critically evaluated" means that your standard is at best still a matter of opinion? It may be the very best available opinion, but it is still an opinion, is that right?

Dr. HORNIG. Well, yes; it is an opinion but it may have many foundations. For example, one of the most important single constants in all of physics is the velocity of light. Now, this has been worked on for two centuries. And quite aside from books, about once every 5 years a paper appears which is the critical attempt to evaluate all the different determinations. They never quite agree. But then it isn't just a guess at the best. It is then a discussion of the probable sources of error in each of the different approaches that have been taken and an attempt to see where there might be systematic errors or where it is simply random errors. And on the basis of such a discussion, they arrive at any given time, at what is considered the most probable value in that case the velocity of light.

Now, the history of progress has been that time after time, as better measurements were later made, actually new measurements, it has turned out that the old best evaluated number was wrong to more than the estimated limits of error. So that you can never be "right," but you can simply get "better" in time.

Mr. MOSHER. But there will be areas, though, where it can't be determined quite so precisely as the speed of light. Won't you be publishing standards—

Dr. HORNIG. Yes. That particular number is known to about eight significant figures now. But, nevertheless, I think most of the data that is compiled is data to quite a high precision, not casual determination, but not nearly as accurate as that. I think most of these data are high precision, for example the thermodynamic tables, it is mainly published to about five significant figures.

Mr. MOSHER. Will there be a problem as to how far you can go, what areas can be dealt with in this fashion and what can't be dealt with, or is that all pretty much understood and acknowledged in the scientific community?

Dr. HORNIG. I think this is part of the practical operation of the system, that is, determining the things that you compile. There are two conditions: one is that it be needed by someone, and to be useful it has to have some reasonable level of precision. If I'm going to design industrial processes or space systems or rocket motors, that determines it on the one hand. The second condition is, there is no point of setting standards beyond the best available level of precision at any point in history. So, if what is needed isn't much better than what has been already attained you don't do it at all. But if the two conditions mesh together, that is, you can arrive at something more useful than what you already have, you do it. It is a combination of the two conditions that will have to be faced.

Mr. MOSHER. They will have to face some difficult decisions, won't they?

Dr. HORNIG. Oh, yes, they have to face the decision. I mean at any given level they have to decide what is the most fruitful areas to put their effort into.

Mr. MOSHER. Thank you, Mr. Chairman.

Mr. DADDARIO. Mr. Vivian.

Mr. VIVIAN. I would like to ask a few questions. Some of these may be better answered by Dr. Hollomon at a later time. If so, please say so.

This question has been asked before, but I want to repeat it. Why is new legislative authority required?

Dr. HORNIG. I think the main answer I would give—there are some details—is that when we talk about the provision of a general service for many agencies of the Government, it becomes very hard for the agency providing it to justify it in terms of its own particular missions. And what we are talking about here is the provision of a general service for the many agencies of the Government and for the private sector. So I think that in order to make this viable in terms of future funding, that the most important thing that is involved here is the general expression of intent by Congress that this general service should be performed and not justified strictly in terms of the Department of Commerce's own needs in this case.

Mr. VIVIAN. I can understand very well why one may desire authorization authority with which to talk to the Appropriations Committee. But it seems to me that this bill does contain some sections not presently authorized.

These relate principally to the ability of commerce to restrict the use of published data and/or its ability to publish the data outside of the Government Printing Office. It seems to me that the real legislative authority granted in this bill lies in these back sections. The authority contained in the earlier sections already prevails.

I also have a question on section 7 (b) which states :

Copy any data compilation hearing the Standard Reference Data Symbol or mark adopted pursuant to section 6 of this Act.

Does that mean to copy the data compilation or to copy the mark? I can't imagine that people won't be copying the data compilation time after time. If you tried to stop them, it would be nonsensical. So it must only mean that they can't copy the mark.

Dr. HORNIG. I feel on shaky ground trying to interpret all of the meanings that might go into those words. I would personally regard it as meaningless to prohibit individuals from copying the marked data. I would assume this applies to the republication of data. If it doesn't it ought to be clarified.

Mr. VIVIAN. As I said, Dr. Hornig, it seems to me the essential authority contained in this bill which doesn't exist is that which lies in these back paragraphs and this particular authority I would not consider authorizing. I can understand that there may be reasons for not recopying the data with the mark under some circumstances or recopying it without the mark under some circumstances. However, it is not obvious to me why there is any objection to having it copied, except to control the profits being derived from it, and I see no reason to control the profits being derived from it.

Dr. HORNIG. I think this is tied to the question of user charges. If they develop it in any given form—

Mr. VIVIAN. Yes.

Dr. HORNIG. The special effort and special expenses are going to be that for which you charge, then as I said I don't think you would prohibit the copying in the sense of use. But an independent republication would bypass the concept of user charges. So the abandonment of one—

Mr. VIVIAN. I can explain why I object to some user paying a user charge. If a person buys this from a commercial firm, he will certainly pay the commercial firm's reproduction cost. If he were to do it on his own copying machines, it costs him money to run the copying machines. It seems to me there should be no objection that this data be used by anybody.

Dr. HORNIG. Clearly the idea is to disseminate data as widely as possible. But I think the problem of user charges comes up as I said when one starts thinking of more sophisticated data dissemination methods than a simple book or where aside from just the general compilations one has to go to special efforts to collect or produce data for special purposes. In such cases it seems to me quite proper that the user should bear some part of the cost of providing the services.

Mr. VIVIAN. Could you give an example of that?

Dr. HORNIG. Yes, for instance, if I am going to set up various kinds of what amount to—I have no idea whether the Bureau in this connection intends to do these things—a retail distribution service of various sorts for the Government, that is, set up a distribution service where

in addition to producing the data, I send out various kinds of abstracts or indices of what is available to people. All of this costs me money and so do replies to requests for the data. I might set up a very elaborate machine for distributing the papers and pamphlets all over the country, and in the absence of any charges I can well imagine that I might get a lot of requests for thousands of copies of everything from many people who unlike me like to have their desks covered with piles of papers.

In this case I would consider this a waste of public funds, and I think one of the simplest restraints on this would be to have user charges.

Mr. VIVIAN. I disagree with your comments. It seems to me if the Government charges some fee for the use of the data, then very few people are going to acquire this data without expending that fee or some equivalent fee such as to a publishing firm or such as their own documentary reproduction offices. I think the purpose is not only to prevent the waste of printed matter, but also to inhibit its availability.

Dr. HORNIG. Well—

Mr. VIVIAN. For example, the American Petroleum Institute may desire a certain compilation of data which nobody else wants and they are willing to pay a portion of the cost of gathering that data—then there might be some justification for user charges. But I can see no other justification for it.

Dr. HORNIG. I have no idea what situations in general might develop. I can see no justification for user charges on this kind of general provision of data.

But as I said, it seems to me that in the cases where special services or where special efforts must be made to collect the data, and this is the case you have cited, that it would. So, as a general matter, I think I would concur with you. Our effort is to get the widest possible dissemination of data. But the bill does not provide for the general use or the general restrictions. It provides authority to restrict under some circumstances, if I read it correctly.

Mr. VIVIAN. Thank you.

Mr. Chairman, I would appreciate it if the staff could review this matter. I believe a far more lucid or less restraining phraseology is required, in section 7, in this regard.

Mr. DADDARIO. Mr. Vivian, the language in this bill is not so firmly fixed that it may not be changed as a result of these hearings. As we get into this question with other witnesses, we can be more precise than we can be today.

I believe that Dr. Hornig has given us the general philosophy concerning this bill without necessarily being specifically in support of this language.

Dr. HORNIG. Mr. Chairman, if I may add, as I said originally, the word "copy" in 7(b) does disturb me. It is republishing that one is really talking about, or—yes, it is commercial publication, I think.

Mr. CONABLE. The question of enforceability of this section I think is a very serious one, to try to prove copying of facts that may have independent existence elsewhere.

Dr. HORNIG. That is correct, although the commercial publication of compilations of data is enforceable.

Mr. DADDARIO. The discussion you have had with Mr. Vivian is going to be helpful to us because it points up that this is a problem. Mr. Vivian, we will follow it more carefully as we go along and if there are others who are as disturbed as you are, we will see what can be done about it.

Mr. VIVIAN. Mr. Chairman, I have just one or two other questions.

Mr. DADDARIO. Yes, Mr. Vivian.

Mr. VIVIAN. I make these comments with reference to that section because, as I say, it is one of the principal new authorities conveyed to the National Bureau of Standards by the bill. Another is section 8, which is effectively a punishment section.

Another new authority contained in this bill is in section 5 which gives Commerce the authority not to use the Government Printing Office. I understand that section is for the purpose of being able to fund ongoing programs with the profits derived from the sale of standard reference data as a part of the user charges concept. Here again, it is not obvious to me that it is in the best interest of the United States as opposed to the interest of the Department of Commerce that this money should not return to the Treasury.

Mr. DADDARIO. Dr. Hornig, you can answer if you like. This seems to me to be a question which we should go at great length into when Dr. Hollomon appears before us.

Dr. HORNIG. Mr. Chairman, I would prefer if you did that, because this particular point I have not carefully thought through.

Mr. DADDARIO. Yes, we will do it that way.

Mr. VIVIAN. The next point relates to section 5 also, the words "person or agency" are listed there, on page 3, line 12: "Data * * * may be published by a person or agency designated * * *." What does that mean? Is this another question you would prefer to hold for Dr. Hollomon?

Dr. HORNIG. I think I would prefer that he take that up.

Mr. DADDARIO. Yes, I would expect that we should probe more deeply into the terminology of all of these sections you refer to, Mr. Vivian, when Dr. Hollomon comes here. This is a matter of interpretation which he is best suited to answer.

Mr. VIVIAN. That completes the questions I had.

Mr. DADDARIO. Mr. Conable?

Mr. CONABLE. No more questions.

Mr. DADDARIO. Mr. Felton.

Mr. FELTON. I had one, Doctor. The whole objective of this program is that the raw data be evaluated by the best people in each field. I would assume that to analyze the data in any particular field would take a considerable amount of time. Is it realistic to ask an expert in a particular field to, say, take 6 months or a year off from the research he may otherwise be doing to perform this function for the Bureau?

Dr. HORNIG. Well, I don't believe it occurs quite that way. Dr. Astin can speak to this in more detail. But much of this evaluation function for any new numbers has to be performed by the people working in the field all the time, without taking any time off. On the other hand, it is realistic surely to have some people who are concerned with what is more mechanical, the compilation and the com-

parison efforts. So, one has a spectrum of people engaged, from the ones primarily engaged in the compilation to some people who like to evaluate work—the scholarly types, and the ones who are the actual researchers that actually have to evaluate—who are actually using the numbers.

Mr. FELTON. What happens if the experts disagree?

Dr. HORNIG. Well, this is why one can never settle this matter until there are newer and better measurements. What the experts have to do is in effect statistically estimate the probable errors in all of their judgments and come to a best conclusion on every physical measurement at any given time. You can only have a best value as of 1966. This is the best you can do in that situation. The whole point though is to make sure that this doesn't happen just by random process and by opinions but that you have actually critically compared just these disagreements and arrived at what you consider a best 1966 value for people to use.

Mr. DADDARIO. Is that what it is all about?

Dr. HORNIG. That is really what it is all about, and it is to be sure that this process happens methodically through all of the areas in which it is needed. At the moment it is done, as I said, where one has special interests. The American Crystallographic Association for its members compiles crystallographic data. There are other compilations by various special groups. But the problem is how do you insure that in the first place it isn't done over and over again, by the overlap, and second, to be sure that it is done in all of the areas in which it needs to be done, and in just the critical way you describe.

Mr. FELTON. That is all, Mr. Chairman.

Mr. DADDARIO. Any further questions, gentlemen?

Yes, Mr. Vivian.

Mr. VIVIAN. I have a brief question.

Were there any dispute by other Government agencies as to either NBS role in this particular bill or as to the nature of the bill? I would like to know what principal questions or objections were raised by other agencies of the Government?

Dr. HORNIG. In the first place, of course, the history of this is that in the Federal Council discussions all of the research and development producing agencies felt this needed to be done. I can make available the original Federal Council policy statement. The Federal Council was unanimous in believing that the NBS ought to play the central role in setting standards and in coordinating the activities, all of the data gathering activities. Because it won't all be done in NBS. I mean, for example, the Atomic Energy Commission continues to have primary responsibility for the nuclear data.

The area in which there was discussion—I am not aware of any dissent and none occurred with respect either to the bill or to the policy statement—is the ancient question in the Government, I mean the one of the extent to which any agency should have any authority to prescribe what other agencies might do.

But that authority is not provided in the bill for precisely that reason. This is a problem we have never resolved to my knowledge in any area we have tried to coordinate.

Mr. VIVIAN. Dr. Hornig, I have one final comment. In spite of my earlier comments which might have been interpreted as being

adverse to the bill, I am not adverse to carrying on the work proposed by this bill. I think it is highly desirable because we are going to be outpaced very rapidly by other nations if we don't become more efficient. However, I would like to make sure the data produced are made available on a very open basis.

Mr. DADDARIO. Mr. Conable.

Mr. CONABLE. Dr. Hornig, has anybody made any estimate of how long it is going to take us to get to a current basis in the evaluation of data?

Dr. HORNIG. Well, I don't really know what you mean by that word "current." If one really wanted to tabulate and assemble just everything that was known, in the first place we would be talking about an order of magnitude bigger than any effort one is thinking about here. I don't believe anyone really would want to compile this massive file of all current data. So that the question really should be how long would it take us and at what expense to compile all the currently important or useful or worthwhile data, and I am afraid I can't answer the question.

Mr. CONABLE. It is a very big project, isn't it?

Dr. HORNIG. Well, what we know is that the needs are much greater than we are carrying on now. This we are sure of. One has to constantly study the question of when diminishing returns set in which is the questions we are really asking.

I am sure we can go another factor of 10 from where we are now in the efficient correlation and assembly of compiled data. But at some point the further efforts wouldn't justify the costs.

Mr. CONABLE. The reason I ask is that one of the scientists I wrote to expressed himself as simply appalled at the scope of this program. He said that he did not see how the standard reference system data could do more than concentrate on the production and yearly updating of a comprehensive annotated bibliography. Is that about all you could really hope to accomplish?

Dr. HORNIG. This sounds too black and white to me. He lives right now—I don't know who he is, but he lives right now on volumes such as the ones I have shown here and on the literature.

Now, it doesn't follow that if I want to improve this situation that I have to go to an all-out effort, that there is nothing in between, and I think my simple answer would be that I could do three times better without getting anywhere near that state. At some point, as you said, diminishing returns would set in.

Mr. CONABLE. You would envision this program as a fairly uniform yearly effort and not some sort of a massive effort at first with thereafter a simple updating?

Dr. HORNIG. Yes. I think we know right now that we need a much bigger and more comprehensive effort than we have now. So I would envision—and this was envisioned by, I might say, the Federal Council and all of the agencies concerned some years ago—the condition that we would build up to a level of effort considerably greater than the one we have now.

At that point, perhaps you mean in the ordinary appropriation process, where one would consider the adequacy of the services being performed on the one hand or the possible redundancy, though I

think we are far from that, on the other hand of the services being performed and make continuing decisions as to whether continuing growth is in order or whether one levels out. I think it is a dynamic question that is going to have to be decided year by year.

Mr. DADDARIO. And as you do it you get more efficient and expend your dollars so as to increase your capability?

Dr. HORNIG. That is right.

There is both the data itself, and the thing we have to learn a great deal about, the methods of disseminating data so the right data gets to the right man.

The thing that is terribly wasteful is the thing we don't know simply how to do anything about, which is the case of the engineer who doesn't know that the number he wants is available somewhere. I have never seen any magical, easy ways of being sure that it gets to him.

Mr. CONABLE. That is all, Mr. Chairman.

Mr. DADDARIO. Mr. BROWN.

Mr. BROWN. Can I just make this inquiry. Do you envision any limit, that you can verbalize, as to how far this would go in terms of either the nature of the reference data or the point at which you would not proceed further because it is becoming too complex and comprehensive or redundant? The thought that occurs to me is that all reference data is really a continuum. For example, take a simple matter of the expansion coefficient of a metal. This varies all the way from absolute zero to whatever the change of state is. Why, to define the thing precisely, for rare metals, you would have to go through this whole link. Is there some way in which you can establish common-sense limits to how far you go in this?

Dr. HORNIG. Yes, in a certain sense one has always to weigh the cost of producing and disseminating more against the value to the users, and I think this is a thing you do continuously. You are quite correct in saying one could go to absurd lengths in tabulating everything. But I don't think I would ever be willing to lay down any absolute rules because activities of the users, the engineers, the scientists, the industrialists, keep on changing, too.

So I would say that as long as there are significant needs and valuable needs not being met, it is time to expand. When you find yourself—and this perhaps relates to user charges—when you find yourself publishing and compiling things that nobody uses, then you probably have gone too far.

Mr. BROWN. In other words, it is difficult then to establish either in the law or in a statement what the limits might be. You see a gap which at present needs to be filled, and within the limits of whatever funds would be made available, you would proceed to fill that gap. Then by an empirical means determine how much further it might be useful to go or whether it has already gone too far.

Dr. HORNIG. That is essentially correct. In the discussions we had in the Federal Council, for example, the Department of Defense, NASA, all the agencies involved, were clear and unanimous about the fact that for all of the industry with which they deal, and for their own internal scientific and technical efforts, that the present magnitude of the effort doesn't fulfill the need and so I believe a substantial, perhaps several times expansion, is in order.

But I think that after the establishment of such a system, that the question you ask would be settled really in the annual appropriation process, for the future, as to whether further expansion is or is not justified.

Mr. BROWN. That is all, Mr. Chairman.

Mr. DADDARIO. Any further questions, gentlemen?

(No response.)

Mr. DADDARIO. Dr. Hornig, thank you. We always learn a little bit more when you come before this committee. This committee will adjourn until tomorrow morning at 10 o'clock in the same place.

ADDITIONAL QUESTIONS SUBMITTED TO DR. DONALD F. HORNIG, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY, BY THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND DEVELOPMENT

Question 1. In your testimony you infer that user charges would only be assessed for special services performed for particular groups. This being the case, would you discuss why the Bureau's present authority to make special service charges is inadequate (15 U.S.C. 275a) to meet the needs for standard reference data?

Answer 1. The inference in question #1 is correct in that I believe that user charges should be assessed for special services performed for particular groups. The difficulty comes in defining "special services" and "particular groups." I would defer to the Department of Commerce for the particulars on inadequacies of present authorities for the National Bureau of Standards. As I understand it, the particular authority it has is to make service charges for performing specific tests and measurements and special services. In the proposed standard reference data program it is constrained by other laws relating to government publications where only minimal printing costs can be recovered, and even these are not credited against the specific program but are returned to the general Treasury.

Question 2. It has been estimated that the Federal government supports in excess of three-fourths of the total research and development performed in the United States. Is it reasonable to say that at least three-fourths of the users of standard reference data will be operating either directly or indirectly under Federal grants and contracts? If not, what is your estimate, and how did you arrive at that figure?

Answer 2. I would not estimate that three-fourths of the users of standard reference data will be operating either directly or indirectly under Federal grants and contracts. Although that may be a valid ratio for scientists and engineers performing federally supported research and development, they are only one class of users of standard reference data. This standard data will be referenced and used also by several other very large classes of users—the professional practitioners, the private manufacturers of commercial goods, medicines, and products, the teachers, the under graduate students, the merchandisers, the design, manufacture and maintenance components of the whole transportation sector, and construction companies. The standard reference data system then will serve not only to further science and technology *per se*, but is one means for transferring the fruits of research and development into the other sectors of the nation's activities and welfare. Recent surveys by the National Science Foundation indicate that only 35% of all scientists are employed in research and development. Further, only half of the 400,000 scientists are engaged in work supported by Federal funds regardless of field of work. It is suspected that an even smaller ratio would apply to the one million engineers, and then there are the many scientists and engineers in foreign countries who are not supported by United States federal funds, but would use United States standard reference data. A guess based on the above factors might be that perhaps one-fourth to one-half of the users of standard reference data will be operating under Federal grant or contract funds.

Question 3. In your testimony you stated that "... the use of reasonable user charges is one of the best ways of determining the value of services performed ..."

(a) *Is it unreasonable to expect that the experts who advise the Bureau that standard reference data be compiled in a particular field are also competent to advise the Bureau if the compilation is of value to the scientific community?*

Answer 3. It is reasonable to expect that the "expert" advice to compile data in a particular field will be based not only on the absence of such compilations, and their feasibility (state-of-the-art-wise), but also on the user needs for the data. Each of these three factors is a necessary condition and no two of them are sufficient. The same individual expert might not necessarily advise on all three factors with objectivity and competence. I believe the National Bureau of Standards can be relied on to seek the variety of expert advice that is required to reach a judicious decision based on all three factors. I understand that in each particular field an attempt will be made to estimate the number of potential users. Either the number of users or the criticality of use can be determining factors.

For the next few years, however, the situation will be one of competition for resources among many subjects fields. The technical experts advising the National Bureau of Standards would not, in my opinion, be able to advise, except in the grossest, most qualitative way, on the relative economic (as opposed to scientific) benefits to be derived from data compilations in different subject areas; until there are some standard measures of the value of information, no one is going to be able to prove specific value.

Question 4. Would the agencies of the Federal government that make research and development grants, contracts or other arrangements with individuals or organizations be required or encouraged to secure from the recipient a commitment to turn into the system data developed with Federal funds?

Answer 4. Federal Government research and development contracts, and research grants too, provide for Federal rights to the results of the work, including rights to information. It is not, therefore, necessary that this legislation also require each contractor to "turn into the system" the data developed. The standard reference data system's principal problems are with respect to data quality, evaluation, standards and format, rather than the "ownership" of data.

Question 5. What is the Administration's copyright policy regarding copy-righting by Federal agencies?

(a) *What is the rationale behind the policy?*

(b) *Is this bill consistent with that policy?*

Answer 5. The Administration's policy with respect to copyright by Federal agencies is to conform with existing law. As you are aware, the existing copyright law is under review by the Congress. I personally feel that some problems that have arisen as a result of greatly expanded scientific and technical activity and concomitant changes in information forms and activities, are not adequately covered by present laws. However, the objectives and purposes of the present copyright law remain honorable and valid.

The bill under discussion (H.R. 15638) as drafted, seeks an exception to existing general practice of copyright. It is consistent with the afore-discussed objectives and purposes, that is, in this particular case it is judged to be in the public interest to give the Secretary of Commerce certain responsibilities and prerogatives with respect to the data compilations. I am encouraged that your Committee is taking a conscientious look at the issues. Out of such an approach can come the best judgment of just what specific responsibilities and prerogatives are warranted. Appropriate safeguards (e.g., time limitations and attribution) on the necessary responsibilities and authorities may not be present in the bill as now drafted. Perhaps these authorities and safeguards cannot be fully defined and itemized in the few words of a bill, but may require the context of considerable discussion to carry the intent and meaning for future specific application and adjudication. I would regret undue deferment of needed legislation just to achieve such refinement.

(Whereupon, at 11:31 a.m., the subcommittee was adjourned to reconvene at 10 a.m., Wednesday, June 29, 1966.)

A BILL TO PROVIDE A STANDARD REFERENCE DATA SYSTEM

WEDNESDAY, JUNE 29, 1966

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT,
Washington, D.C.

The subcommittee met, pursuant to adjournment, at 10:25 a.m., in room 2325, Rayburn House Office Building, Hon. Emilio Q. Daddario (chairman of the subcommittee) presiding.

Mr. DADDARIO. This meeting will come to order. Our witnesses this morning will be Dr. J. Herbert Hollomon, Assistant Secretary of Commerce for Science and Technology, and Dr. Allen V. Astin, Director of the National Bureau of Standards. I think in order to proceed more expeditiously we will have Dr. Hollomon give his statement, to be immediately followed by Dr. Astin. We will hold our questioning until both statements have been given unless there is something which any of the members would like to have clarified as we go along. If you would proceed, Dr. Hollomon. We are happy to have you both here.

STATEMENT OF DR. J. HERBERT HOLLOMON, ASSISTANT SECRETARY OF COMMERCE FOR SCIENCE AND TECHNOLOGY

Dr. HOLLOMON. That is perfectly all right. We are always happy to be here. We have a warm feeling in our hearts for this committee, both in terms of its actions and the fact that you are so interested in the kind of things that we are interested in.

Mr. Chairman and members of this subcommittee, a serious inefficiency in our methods of application of science and technology to meet national needs is the lack of an adequate system for making expertly evaluated data on the properties of substances readily available to the nation's scientists and engineers. The process seems simple; data must be extracted from the world's literature, their reliability evaluated, and then they must be put in the hands of the man or woman who is going to use them. In practice the difficulties are great, as I shall describe later.

Fortunately, something can be done, and is being done, to reduce this inefficiency. We are here today to urge favorable action on legislation to further the efforts of the Department of Commerce, through the National Bureau of Standards, to serve this urgently felt need of the Nation.

The importance of critically evaluated data on the physical and chemical properties of substances and their interactions—commonly called standard reference data—is fully recognized by the technical community but is not well understood or appreciated by those who have not spent a great deal of time making scientific and engineering calculations. Therefore, I would like first to give a brief explanation of why standard reference data are important and how they are produced. Then I should like to describe the current status of national efforts to produce and disseminate standard reference data and explain why we are seeking this legislation to expedite the national program.

Scientists and engineers all over the world measure the properties of substances and their behavior when interacting with each other and with energy in its various forms. The substance may be anything from a subnuclear fundamental particle, to a nucleus, an atom, a molecule, or a complicated mixture or solution.

The results of the measurements are numbers whose values depend upon the standards maintained in this country by the National Bureau of Standards. These numbers are published in scientific journals, reports, handbooks, and other publications. Therefore, the numbers are available to anyone who can locate them. But it is often extremely difficult to locate a specific number in the literally millions of pages of scientific literature, and, once located, also difficult to determine just how reliable the number is.

The problem is complicated by the fact that often more than one researcher works in the same field (and at different times) each coming up with his own measured value for the same property. Only a specialist in the field can tell which is most likely to be correct.

The problem, therefore, is to—

- (1) Extract the necessary data from the literature;
- (2) Determine the accuracy and reliability of the data through a process of critical evaluation; and
- (3) Make the evaluated data readily available to users.

Hence, there is a need for standard reference data—called reference because scientists and engineers repeatedly refer to them in their work, and called standard because differing values are critically evaluated by the most competent scientists in the field who then select and certify a single value or range of values as the best or standard one. The critically evaluated data may then be used with maximum confidence, though they may always be revised in light of new knowledge.

Of the approximately million and a half scientists and engineers in the United States, about a quarter of a million are electrical engineers. How this group, for example, uses data illustrates the need for standard reference data. These engineers must use such properties as electrical resistivity, thermal conductivity, magnetic permeability, and melting point in their everyday work.

These and other properties enable electrical engineers to design communications devices, such as radios, TV, microwave systems, telephone systems, or electrical components for use in automobiles, in the home, in the factory, or in highly sophisticated space vehicles, where the components have to work reliably under extreme conditions.

These engineers also design power transmission systems, in which they must include safety controls—devices that cut off power when an overload or other dangerous possibility occurs.

Hundreds of thousands of engineers are concerned with transportation—motor vehicles, railroad and subways, airplanes, ships. In their daily work they need to know properties of alloys, metals, rubber, plastics, fuels, and a host of other materials.

In dealing with other great national problems, such as pollution, corrosion, safety, health, or contamination, engineers and scientists depend upon reliable and readily available values for the properties of materials to do their job well. For example, what are the properties of fuels which bear on smog control? What are the properties of detergents, especially how they break down in chemical reactions that render them harmless?

The melting point of a given ceramic material more specifically illustrates the need for reliable data. A team of engineers has the assignment of designing a space vehicle that will successfully withstand the exceedingly high temperature generated by friction as the vehicle reenters the atmosphere from a trip in space.

The design of this vehicle must take into account many considerations, among which are: (1) How much heat will friction generate on a given material with specific surface and other characteristics at a given speed in a given atmospheric density; (2) how much heat will the material tolerate before it breaks down or melts; (3) how can this heat be contained, dissipated, or insulated to protect the occupants or instruments in the vehicle.

If the necessary data to make these calculations are uncertain or unreliable, or hard to come by within the time available, the engineers are faced with undesirable alternatives:

They can make a new measurement to determine the needed number, thus duplicating work that has already been done, and with no guarantee of greater accuracy, or

They can overdesign the vehicle to assure safety. Thus, if the unevaluated data available shows a range of melting points for the particular ceramic material from 1500° to 2000° C., they would use the lowest one to be safe. But if they knew that a higher melting point were a reliable number, they could design accordingly.

Uncertainty and inaccessibility, therefore, are costly; they waste money, time, and scarce professional manpower; they cause delays in and sometimes abandonment of projects.

The present lack of a comprehensive, effective standard reference data system costs the Nation hundreds of millions of dollars each year. This is so because the work that an integrated, comprehensive, Standard Reference Data System could do is already being done. Nearly every member of the technical community does part of the job himself—piecemeal, uncoordinated, and usually less effectively than if done by an expert. Properly operated at full potential, a Standard Reference Data System could return in our estimate \$20 to \$200 for each dollar spent on it.

The products of the Standard Reference Data System are valuable to the technical community because numerical data are made both more readily accessible and more reliable. Dollar benefits result from (1) savings of time of users in searching through scientific reports for numerical data; (2) savings of time in evaluating and selecting most reliable answers from among those found in scientific report; (3)

savings of time and materials spent in unnecessary measuring of properties of substances for which the data actually reported in the literature could not readily be found; (4) savings of time, equipment, and materials through use of better—more reliable—data.

Some of these savings—those in the first two categories—can be estimated quantitatively. An illustration is the example of NBS Circular 500, "Selected Values of Chemical Thermodynamic Properties," issued originally in 1952 and now being revised. This volume contained several thousand values of certain fundamental thermodynamic properties of all the elements, all inorganic compounds for which data were available, and organic compounds containing one or two carbon atoms.

Over 7,000 copies of this book were sold—to scientists and engineers in academic laboratories, industrial laboratories, and government laboratories. Using conservative assumptions about the number of persons using each volume and the amount of time saved at each use because the individual did not have to search and evaluate for himself, we estimate that the equivalent value of this one volume to the economy of the United States has been \$50 million. The cost of producing this publication was about \$250,000. The ratio of benefits to cost in this case is 200 to 1—an unusually favorable ratio.

It is this type of estimate, which can be made for numerous similar works now in existence, which leads us to the conclusion that each dollar spent on producing standard reference data will save the economy \$20 to \$200. I must point out that these savings will be difficult to find. They will be made up of thousands of small timesavings, equivalent to a few dollars here and a few dollars there. No one will file a cost-saving report with his administration listing an item of \$30 for 3 hours that he didn't spend in the library because a compilation of evaluated data was available to him.

The estimates just described do not take into account the value to the economy of the availability of better data. These values are inestimable. How would one determine, for example, how many manufacturing plants had to be designed with broader tolerances because the available data were less reliable than they might have been? How does one determine how many missile shots have failed because incorrectly evaluated data were used in the design of some component? Although such incidents cannot be definitely identified, every scientist and engineer is confident that they occur and that they are costly.

Important as such benefits are, they are perhaps matched in importance by the guidance provided to measurement practices by the data compilations. The thorough critical evaluation of sources of uncertainty in measurement technique inevitably leads to an upgrading of the quality of subsequent measurements in laboratories all over the country.

This effect has already begun to be felt as a result of the present NBS program. Further, by pointing out gaps in the availability of data and by identifying key properties for which higher precision is required, data evaluations serve as a means for an experimentalist to determine which measurements deserve high priority in his program.

The question may well be asked: "If these compilations are so important, why is an enhanced program needed to make sure that they are available?" The answer to this question is the observed fact that

existing mechanisms for producing critically evaluated compilations have not been able to keep up with the flood of new data appearing in the literature.

Throughout the history of recorded science, numerous data compilations have been produced, largely in response to an urgently felt need of some part of the technical community. Some compilations were one-shot projects, resulting in a product that was never updated; others have been continuing activities lasting over many years. Some were sponsored by private organizations. There was no coordination or standardization of format or quality, and in some technical areas there was extensive duplication.

In recent years, murmurs of concern over the situation rose to a clamor that something be done. Committees of the President's Science Advisory Committee and of national professional societies carried out studies and made recommendations. The National Academy of Sciences attempted to stimulate new and expanded activities.

Mission-oriented agencies initiated crash projects to satisfy long-standing needs of which they became newly aware. The Coordinating Committee for Material Research and Development of the Federal Council for Science and Technology urgently recommended that a comprehensive program be started. The National Bureau of Standards laid plans for increasing the level of effort in its organization.

Recognition of the problem and the cost to the Nation of failing to solve it are the reasons behind the recommendation that a Standard Reference Data System be established. This system came into being in 1963 through action of the Federal Council for Science and Technology and the President's Office of Science and Technology.

Responsibility for its administration was assigned to NBS. The Standard Reference Data System is considered to be one of the components of a broad national scientific and technical information system now being developed by the Committee on Scientific and Technical Information (COSATI) of the Federal Council for Science and Technology.

Briefly, the responsibilities of NBS are the following: (1) Promote compilation of evaluated data; (2) coordinate related work under the auspices of all Government agencies; (3) establish standards of quality for all products of the system; (4) operate a Standard Reference Data Center at NBS; and (5) establish standards of methodology and such other functions as are required to insure the compatibility of all units of the Standard Reference Data System. Dr. Astin's statement provides a description of the steps he has taken to discharge his responsibilities for the program.

Because of the universally recognized value of data compilations, scientists in other countries have also undertaken systematic programs. We have already had productive discussions with responsible officials in the United Kingdom, France, Germany, the U.S.S.R., and Japan regarding possible cooperative or joint programs.

The International Council of Scientific Unions has recently established a committee to serve as a coordinating body and channel of communications. The Department of Commerce intends in the subsequent development of the standard reference data program to maintain close and cooperative relationships with effective groups throughout the world, within appropriate foreign policy guidelines.

During the 3 years that the National Bureau of Standards has served as administrator of the Standard Reference Data System I believe that a good start has been made toward satisfying the general obligation of supplying standard reference data to the American technical community. These years of operations have, however, revealed the need for additional authority from Congress in order to increase our effectiveness. The authorities needed are contained in the proposed legislation before you.

Although the start we have made is, in my opinion, good, it is only a start. A significantly higher level of effort is now needed in order to realize a greater share of the potential benefits. The proposed legislation provides mechanisms for the necessary funding of the program through a combination of congressional appropriations and user charges.

The President as well as Members of the Congress have frequently suggested that, whenever feasible, identifiable customer groups should be required to bear the costs, or at least part of the costs of specialized Federal services provided in their behalf. The authority requested in the proposed legislation would enable the Secretary to apply this principle to certain specialized information services that we propose to provide or have provided as a means of disseminating reference data in the forms most useful to users of the System.

In order for the standard reference data produced pursuant to regulations established by the Department of Commerce to be readily identified, we propose to adopt an easily recognizable symbol. In years to come, this symbol will stand as a signpost of quality; the technical community of the Nation will know that they can rely upon products bearing our sign.

To maintain the integrity of the symbol we need the authority to prevent others from using it without authorization from the Secretary, with penalties provided for unauthorized use. These provisions, which are included in the proposed legislation, also serve to protect the system of user charges by preventing unauthorized publication and sale of compilations bearing the symbol.

Finally, approval of this bill will make clear by statute the central responsibility of the Secretary of Commerce for establishing procedures for evaluating the data.

With these additional authorities, and with the support of this committee and of Congress, we are confident that we can make an important contribution toward increasing the total effectiveness of the Nation's research and development effort.

Mr. DADDARIO. Thank you, Dr. Hollomon.

Will you proceed, please, Dr. Astin?

STATEMENT OF DR. ALLEN V. ASTIN, DIRECTOR, NATIONAL BUREAU OF STANDARDS, ACCOMPANIED BY ALLEN J. FARRAR, LEGAL ADVISER, NATIONAL BUREAU OF STANDARDS

Dr. ASTIN. Yes, thank you.

I appreciate very much the opportunity to appear today in support of the Standard Reference Data Act, H.R. 15638. Enactment of this bill will significantly improve the ability of the National Bureau of Standards to perform a critically needed service for the Nation's tech-

nological community. My statement today is complementary to that of Assistant Secretary J. Herbert Hollomon and will deal primarily with the way in which the National Bureau of Standards plans to implement the proposed legislation.

Throughout its history the National Bureau of Standards has undertaken the preparation of compilations of critically evaluated data for use by the technical community of the United States. Indeed, this type of activity is specifically authorized in section 2 of the Organic Act of the National Bureau of Standards, which states:

In carrying out the functions enumerated in this section, the Secretary is authorized to undertake the following activities and similar ones for which need may arise * * * : (19) the compilation and publication of general scientific and technical data resulting from the performance of the functions specified herein or from other sources when such data are of importance to scientific or manufacturing interests or to the general public, and are not available elsewhere. * * *

These compilations have proved to be extremely valuable to the Nation's research and development effort. I think it is safe to say that some data from NBS Circular 500, which Dr. Hollomon referred to and which I have here with me, "Selected Values of Chemical Thermodynamic Properties," have been used in the design of every chemical manufacturing plant and every rocket propulsion system built in the United States since the volume appeared. Similarly, the atomic energy level data from NBS Circular 467 have become definitive for studies of upper atmosphere physics, of stellar composition, and of laser mechanisms.

When it became apparent some years ago that the total national level of effort on the production of data compilations was not maintaining pace with the needs of scientists and engineers a few knowledgeable individuals, both within the National Bureau of Standards and throughout the scientific community, explored various ways of attacking the problem.

These studies led to the development of a plan for a decentralized operation with a small program management office located within NBS and data centers located throughout the country in laboratories where special competence existed. On learning of this plan, the Committee on Scientific Information—now the Committee on Scientific and Technical Information—brought it to the attention of the Federal Council for Science and Technology. This group, which had been concerned about the data situation for some time, endorsed a Federal policy statement establishing a Standard Reference Data System in order "to provide on a national basis critically evaluated data in the physical sciences."

This policy statement calls upon the National Bureau of Standards to assume responsibility for the administration of the Standard Reference Data System. The specific responsibilities enjoined upon NBS have already been listed in the statement of Dr. Hollomon. I would like to describe for you now the nature of the program we have embarked upon to meet our responsibilities.

The overall goal of the Standard Reference Data System is to provide to the technical community of the United States optimum access to critically evaluated quantitative data on the physical and chemical properties of substances and their interactions. The coverage is to be comprehensive, timely, and readily accessible.

Within the National Bureau of Standards the responsibility for administering the Standard Reference Data System has been assigned to the Office of Standard Reference Data created for that purpose within the Institute for Basic Standards. Dr. Edward Brady, Chief of that office, is here with us today.

Three major groups of activities within the Office of Standard Reference Data have been initiated; these are concerned with: (1) The planning and implementation of a series of data compilation activities organized according to technical scope; (2) an information systems design and research activity; and (3) a variety of specialized information services to be provided to the technical community by the Office of Standard Reference Data.

In developing and operating the data compilation program up to the present time, the Office of Standard Reference Data has established activities in seven broad categories of properties: (1) Nuclear properties; (2) atomic and molecular properties; (3) solid state properties; (4) thermodynamic and transport properties; (5) chemical kinetics; (6) colloid and surface properties; and (7) mechanical properties.

In each of these, responsibility for developing a comprehensive, coordinated program has been assigned to a Program Manager. Existing projects of other governmental and nongovernmental agencies are taken into account and project priorities are determined by consultation with groups of specialists from the academic world, from Government, and from industry.

Some of the projects are conducted within the experimental divisions of the National Bureau of Standards; others are in university laboratories or in other Government laboratories; a few are in industry. None are under the direct operational supervision of the Office of Standard Reference Data, which is exclusively for program management.

The data evaluation and compilation activity is normally conducted as part of the ongoing program of a productive experimental group, with an established reputation for competence and vigor. Data evaluation can only be done adequately by a specialist in the field, a person of mature experience whose judgment is respected by other experts.

The information systems design activity concentrates on the problems of handling data, on communications and connections between data centers, and on the technology (hardware and software) required to make the data storehouse most available to the user in the U.S. technical community.

To place the information systems design into practice, a variety of services is being planned, making use of the storehouse of data in the NBS Standard Reference Data Center in Washington. This storehouse will eventually contain a complete collection of compilations of critically evaluated data produced throughout the world.

The services in the planning stage include supplying replies to specific inquiries, preparation of a "current awareness" publication, operation of a library of computer tapes and programs, and preparation of special data handbooks as needed by a particular group in the technical community. Other services may be added as the need becomes apparent. The authority requested in the proposed legislation would facilitate our ability to provide a variety of user services with the customer bearing an appropriate share of the cost of specialized services.

Since fiscal year 1964, the National Bureau of Standards has conducted SRDS activities along the lines of the plan of operation just described. The needs of the technical community have been explored in cooperation with panels of specialists in each of the technical areas previously mentioned. Significant progress has been made in coordinating and extending existing coverage in some of the technical categories, especially in the areas of thermodynamics and transport properties and in atomic and molecular properties (which have been judged to be of highest priority for additional effort).

In the field of nuclear data, existing activities sponsored by the Atomic Energy Commission provide coverage of the most important technical topics, although the level of effort needs to be increased to meet the rapid rate of appearance of new data. Greatly increased effort on newer kinds of solid state data—energy levels, band structure, interaction with radiations, et cetera—has been recommended by our solid state advisory panel.

In the field of chemical kinetics the first stage of the program has been the preparation of a series of critical reviews of the state of quantitative knowledge in selected aspects of the field. The activities in the area of colloid and surface properties are the result of a cooperative relationship with the National Academy of Sciences-National Research Council Committee on Colloid and Surface Chemistry, which had been planning an extensive program of data evaluation prior to the establishment of the Standard Reference Data System. A preliminary critical survey of the field of mechanical properties has been carried out in order to determine appropriate activities.

Continuing efforts have been initiated to establish and promote effective working relationships with program officers in other Government agencies—such as Atomic Energy Commission, Department of Defense, National Aeronautics and Space Administration, National Science Foundation, National Institutes of Health, and others—in order that the National Bureau of Standards program might be responsive to the needs of these agencies.

In some cases, jointly funded projects have been established. In others, Office of Standard Reference Data staff members have served as a means through which program officers in other agencies were able to locate the competent staff needed to undertake the compilation activities required for their missions. Steps have been taken to insure that persons working in closely related areas are fully aware of each other's activities. The search for competent technical people willing to undertake data compilation and evaluation projects continues.

Modest NBS budgets for the first 3 years of operation, plus continued support by various other Government agencies which have a need for standard reference data, have enabled the National Standard Reference Data System to develop a few projects in the areas of greatest urgency. The present annual level of expenditures by all participants totals approximately \$4 million, of which NBS obligates \$1.5 million. Our present estimate of the level required to satisfy the high-priority needs of U.S. science and technology is four to five times the present level.

This judgment is based on the following sources of information:
(a) The recommendations of advisory panels, which include many of

the Nation's foremost scientists and engineers, (b) results of a survey of the needs for numerical data among 100,000 scientists and engineers, a survey conducted by the American Chemical Society, (c) numerous discussions with individual consultants and leaders of existing data compilation projects, (d) consultation with research and development program leaders in mission-oriented agencies, and (e) awareness of foreign and international data compilation activities and plans.

The proposed Standard Reference Data Act would enable us to apply user charges to the costs of the program. Therefore, the appropriations required would be reduced by the amounts realizable from such charges. Although these amounts cannot be estimated in advance with precision, our present estimates indicate that a significant, but perhaps not large, fraction of the total cost of operation would be recoverable.

In the development of the program of the Standard Reference Data System several alternative approaches have been considered. These alternatives may be summarized in the following way: (1) Continue the present pattern of uncoordinated response to especially urgent needs; (2) set narrower goals for NSRDS; (3) set broader goals for NSRDS; and (4) rely on the other approaches to the scientific information problem such as is envisioned in programs of Chemical Abstracts, the American Institute of Physics, the American Society for Metals, and other nongovernmental professional societies. Each of these possible alternatives will now be discussed.

(a) Continue present system: It was the deficiencies of the existing situation that led to the establishment of the Standard Reference Data System. Nevertheless, the technical effort of the United States was making progress in the absence of the SRDS, and it can continue to do so. A properly operated Standard Reference Data System may increase the overall efficiency of the Nation's technical activities by perhaps 1 percent or perhaps as much as 5 percent.

An inefficiency of this magnitude is tolerable in the total effort; indeed, it is hardly detectable. It cannot be claimed therefore that an essential goal of the United States will not be achieved if the SRDS is not fully implemented as rapidly as possible. It is claimed, however, that hundreds of millions of dollars will be unnecessarily spent in the achievement of those goals unless the SRDS is effectively implemented.

(b) Set narrower goals: The goals of the Standard Reference Data System have been circumscribed by the definition of the technical scope of the program. That is, the program is to be concerned with data on the intrinsic properties of well-defined substances and their interactions.

The goal of the 5-year program is to achieve 90 to 95 percent coverage of all the properties which are determined to be of high priority as determined by surveys and consultations with specialists. This goal has been set because it is achievable with the expenditure of modest funds, it is probably within the capability of available manpower in the United States, and the scope is harmonious with the traditional areas of expertise within the National Bureau of Standards.

Clearly, the goal could have been set at a more modest level. The practical realities of funding within the National Bureau of Stand-

ards force us to the conclusion that it is unlikely that we shall attain the resources to carry out the program at the level stated. One of the very attractive features of this program is the fact that the benefits to be obtained at all levels of expenditure up to four to five times the present level are proportional to the amount expended. The region of diminishing returns is not reached until activities begin on those properties which are identified as of less than "high priority."

(c) Set broader goals for SRDS: The benefits to be obtained from systematic data compilation activities are not exhausted when the scope defined for SRDS have been covered. Many properties of imprecisely defined materials—concrete, plastics, steels, et cetera—are of enormous importance for technological purposes. Many types of data gathered in the earth sciences are now outside the scope of SRDS, but make vital contributions to understanding of the environment.

A program to include these other types of data would double or triple the resources in money and manpower required. Some of the areas involved are outside the traditional range of activity of NBS. The availability of technical manpower to accomplish such broader objectives is also questionable.

For these reasons, no plans have been made within NBS for enlarging the scope of our planned program. As additional experience is gained through operation of the program under its present restrictions, it will be necessary to review the scope regularly in order to determine whether broader goals are appropriately within the mission of NSRDS.

(d) Rely on other approaches to the scientific information problem: The problems of making scientific and technical information of all kinds more readily available to the technical user who needs it are receiving great attention from various professional societies in the United States and throughout the world. In particular, the American Chemical Society, the American Institute of Physics, the American Society for Metals, and the Engineers Joint Council are beginning to plan extensive programs.

These programs are all concerned with the entire substance of the disciplines within their purview—concepts, experimental techniques, interpretations, data, and practical applications. Ultimately, the programs now being formulated by these societies will, if fully implemented, have a profound effect on the operations of the numerical data centers that comprise the Standard Reference Data System. To implement the concepts being developed, however, requires the solution of intellectual problems of great complexity, as well as the solution of management and funding problems of equal difficulty and complexity.

It is unlikely that the work of these organizations can make any significant contribution to the numerical data problem for a period of 5 to 10 years. To delay the opportunity of achieving clearcut, immediate gains through the well defined programs of SRDS while awaiting as-yet-to-be-conceived solutions to larger problems is not in the interest of scientific and technological efficiency or progress.

Thank you, Mr. Chairman.

Mr. DADDARIO. Dr. Astin, if we could touch for a moment on the section that you just completed. You refer to the work proposed by

the American Chemical Society and these others indicate that they can do the job, but that it will take time. I wonder if you could give us some indication as to how they feel about this bill, and whether or not any thought has been given to supporting their efforts so that they could achieve their goals in a lesser time?

Dr. ASTIN. The primary support of these programs, according to my understanding, already is provided by the National Science Foundation. But everybody, including these groups involved, appreciates the great importance and complexity of the total scientific information problem and are trying to find ways of accelerating meaningful solutions to the total problem. It is recognized by the people involved in those programs however, that the solution of the numerical data information problem is a much more straightforward and simpler one and one with immediate benefits. So, according to our understanding, all of the people concerned with the broader information problem are anxious to have us go ahead with the solution of the numerical data information problem, because nothing we will do on that will be of a form that cannot ultimately be integrated into the broader information activities.

Mr. DADDARIO. Then your feeling is that they believe this effort will be complementary to theirs and not in conflict?

Dr. ASTIN. That is correct.

Dr. HOLLOMON. Mr. Chairman, what this group is trying to do, which we refer to here, is to develop an effective system for the information storage and retrieval scientific information. This is an extraordinarily complex task. The business of critically evaluating the specific numerical values and publishing it is much more direct and can be accomplished immediately.

To answer your second question, we have worked out arrangements with these societies—the American Chemical Society to be more explicit—and where they are competent to provide the critical evaluations, we will cooperate with them. That is intended to be a part of the program.

Mr. DADDARIO. What is the nature of these arrangements?

Dr. ASTIN. Well, our people in the Office of Standard Reference Data have close contacts with the information programs of these other agencies. There are many common problems.

For example, the first phase of the Standard Reference Data problem is the search for literature. It is also a problem that is common with the broad scientific information problem. So, in improving techniques of searching for literature and in making indices of what is in the literature, we have a common interest. In this we are working together closely.

Mr. DADDARIO. Then we should consider your explanation here as not being an alternative through which this can be accomplished but rather an supplementary kind of activity?

Dr. ASTIN. That is correct.

Mr. DADDARIO. Is it in that nature?

Dr. HOLLOMON. I quite agree.

Mr. DADDARIO. The matter of sharing costs, which you both touched on, seems to be of some concern to the committee. Mr. Vivian and others went into that yesterday. I am sure there will be further

questioning about this. I would like to ask how we reconcile the present authority, that you have, as shown in the United States Code, with a charge for services.

Dr. HOLLOMON. The question is what is meant by services. Publications are not considered to be services. We can charge currently under our present authority for such things as calibrations, standard reference materials, but we do not charge for initial publications under that authority.

Mr. DADDARIO. Would the recoverage from service charge be something less than the cost of a full publication if you were asked to provide specific information of a specific nature?

Dr. HOLLOMON. We would wish to recover the significant part of the cost of the materials, the printing, and the reproduction, and some part of the editorial and compilation costs.

Mr. DADDARIO. What is your view of that Dr. Hollomon and Dr. Astin? What do you consider it to be appropriate? Do you feel it to be helpful rather than harmful?

Dr. HOLLOMON. We have under the present authority the ability to recover substantial direct costs and some of the associated costs. If we couldn't recover that cost, that is if it didn't go back into a trust fund, the more service we rendered, the less appropriation would remain available to develop new methods and means for providing essential calibration services. Under such conditions, the better we did our job, the less money we would have to do it with. That is the real intent and thrust of the trust fund activities for calibration and standard reference materials. It allows us to recover for the services supplied to these people who need it, a fraction of the cost.

The second problem is how do you determine really what the user need is. How do you determine that we are doing something that is really useful to the scientific and technical community. One of the ways is to have them pay for part of it. Take the case of a compilation of data, which would be very expensive intellectually—by this I mean having scientists go in and evaluate it and so on—and for which there are only a relatively few possible customers. I think in this instance you could argue that the Nation will be better served to be sure that data is available. But if the compilation is made available at no cost, or at a relative insignificant fraction of cost, you would have no easy mechanism to determine whether you were doing something that was of service.

In the selling of reference materials and calibration services, and one of the real measures to find out whether this service is useful, is whether the user is willing to pay a share of the cost. So, my own feeling is that some fraction of the costs of these reference data services should be borne by the specific user who can be identified. In large measure, these are going to be institutions and libraries for these kinds of data.

Another aspect of the problem has to do—

Mr. WAGGONNER. Would you stop there just a moment? Where do nonprofit institutions and libraries fit into this picture of paying user costs?

Dr. HOLLOMON. Nonprofit institutions and libraries would under the proposed system pay a part of the charge necessary.

Mr. WAGGONER. Less than the private institutions?

Dr. HOLLOMON. No difference. There would be no difference. The charges would be the same to all comers. We would not try to discriminate between one person and another.

Mr. DADDARIO. Mr. Waggoner has a good point. Are you preventing people who need the information from getting it?

Dr. HOLLOMON. I don't believe that is the case. In no case do we intend to recover full costs. In no case can we recover full costs, nor do we propose to.

Mr. DADDARIO. I am persuaded somewhat by the argument which was raised yesterday by Dr. Hornig, but I am not convinced that it is so. I wonder will people believe that the information is good because they pay for it, or would they ask for it anyway even if they didn't have to pay for it?

Dr. HOLLOMON. There are two points to the question which I will repeat. First, it is my view that some fraction of the cost should be recovered in order to have a measure of whether or not this service is useful. I think we should have some mechanism of making that determination. It has been successful in two other services that the National Bureau of Standards renders. One is calibration services, as I say, and one is standard reference materials.

You calibrate an instrument to make sure it makes the same measurements throughout the country. This is not unlike the business of having a number which you are sure is reasonably accurate. We do the same thing with standard reference materials.

I would not believe that we should recover all costs, this is because in some instances the cost of the evaluation and compilation may be very high, particularly in a highly complex technical subject. But on the other hand, we do believe that something more than just recovering paper and printing costs, would be appropriate.

Mr. MOSHER. Do I understand correctly that the user charges will be made on some data but not on others?

Dr. HOLLOMON. No. We would intend to have user charges on all data, but the degree to which you would apply the original intellectual cost may be different depending on how much that relative investment is against the total amount that you would expect to sell.

Mr. MOSHER. The discretionary authority would lodge in the Secretary?

Dr. HOLLOMON. Yes.

Mr. MOSHER. Would the charge be whatever the market will bear?

Dr. HOLLOMON. No; I do not think that is the case. I think a valid judgment would have to be made—Dr. Astin may wish to speak to it—as to the degree to which this data were critically needed and, to some degree, how many possible customers there are. I don't think it is what the market will bear in this sense. Let me turn it around in another way.

Mr. MOSHER. In other words, the price you charge will be based on the demand?

Dr. HOLLOMON. I would put it a little bit differently than that. Let me give you a specific example. Here is a book of mathematical tables. It cost, as I remember, approximately, \$500,000, to produce. This includes the compilation of the tables, the editorial work, the

setting up of the necessary tables and format layout, the paper, the printing, and so forth.

As I remember, that was sold for \$6.50.

Dr. ASTIN. \$6.50.

Dr. HOLLOMON. 50,000 copies were sold by the Government Printing Office. I think if you priced that according to its market demand, you could sell many books at \$60, \$70, or even \$80. I don't think we should do that. But I do think it would not be inappropriate to have charged part of the editorial costs as well as the printing and publication costs, perhaps selling it for \$15 rather than \$6.50.

Mr. MOSHER. But you will have data which will be costly to obtain and produce for which there won't be much demand.

Dr. HOLLOMON. That is correct.

Mr. MOSHER. Would you still have the same price on it?

Dr. HOLLOMON. I think the price will depend—

Mr. MOSHER. Will the user charge still be essentially the same?

Dr. HOLLOMON. Except in rare instances where the amount of editorial content and compilation is extraordinarily high compared to the number that seem to be needed, I think as a general principle the user charge will consist primarily of editorial charges and setup charges, as well as printing and publication costs.

Mr. MOSHER. When you have the user charge, and you don't have any demand, this will be a sign to you that you don't need to devote as much time to this category?

Dr. HOLLOMON. That is exactly right. I do not know how else to make that judgment if we simply say we give it away or take very reduced costs, and therefore anyone has it, because they would like to have the volume. We are suggesting that there be some measure, not the only measure, of the responsiveness of the system to the needs.

Dr. ASTIN. I would like to supplement that with an illustration of what I would consider a specialization where we would expect the user to pay the full cost. Suppose we have a handbook which is being revised on perhaps a 5-year cycle but there are some customers that don't want to wait for 5 years and would like the special service of looseleaf supplements or something of this sort in the interim.

It seems to me that the people who want this special type of service should be required to pay for it. So we would plan in such cases to attempt to recover the whole costs of the special sort of supplementary service in advance of formal publication.

Mr. DADDARIO. Don't you have the authority to do that now?

Dr. ASTIN. If it is a publication, we do not.

Mr. DADDARIO. Not the full publication.

Dr. HOLLOMON. No part of a publication.

Dr. ASTIN. No part of the publication cost.

Dr. HOLLOMON. The GPO can recover printing and publishing costs, but not any of the extra work. Let's suppose during the progress of this volume somebody needed this particular section very badly, and we weren't ready to get it published. Suppose we had to pull this section out, do special editorial work, and so on, to meet this urgent need. It seems to me if the need is important enough for that, we ought to be able to recover our cost, and, we should not be expected to meet every demand of everyone under such conditions unless they pay for the special service.

A demand for such special services that would not have been encompassed in putting out this whole volume. At the present time we could recover none of our costs other than the actual printing and paper for such service, and that would go to GPO.

Mr. DADDARIO. What would you do if there were not sufficient demand to recover the cost but it was still extremely important to one individual or company?

Dr. HOLLOWON. This is a problem I tried to explain earlier. I was responding first to Dr. Astin's example where there is a demand for a special service that we did not intend to provide at all. The second question you now ask is what would you do where there were a few people in the country known to need the data, but where the cost of compilation is very high.

Mr. DADDARIO. I feel this would fall within this provision of the code; don't you?

Dr. HOLLOWON. Yes, sir; I do.

Mr. WAGGONNER. Dr. Hollomon or Dr. Astin, you make the statement that this proposed Standard Reference Data Act would allow you to recover a significant, but not a large, fraction of the total cost of the publication of some particular operation, for example, such as the compilation of mathematical tables. What do you call "significant"? Are you talking about 50 percent or are you talking about 25 or 30 percent? We can't define "significant," but can you estimate the percent generally?

Dr. HOLLOWON. I think it might be different, as I said, depending on the degree of effort that would have to go into it. We have evaluated various publications, and I would say that the range would be something between, say, 20 and 60 percent on any given volume but no more on the average across the board than something on the order of 20 or 25 percent.

Mr. WAGGONNER. The compilation of the mathematical tables to which you just alluded. How many of these did you distribute?

Dr. HOLLOWON. 50,000 at \$6.50.

Mr. WAGGONNER. Did I not understand you to say that 50,000 of these maybe should have been sold for \$15?

Dr. HOLLOWON. That I think would be fairly reasonable. This would be a third, or something of the order, or half of what they would have been sold—

Mr. WAGGONNER. That is \$750,000. You said it cost you \$50,000 to produce it, and you only wanted to regain 50 percent.

Dr. HOLLOWON. I said it cost us \$500,000. There were additional charges which the GPO had which I don't know.

Mr. WAGGONNER. We have exceeded the total cost and have probably charged the people who provided the information in the first place for producing it back for them.

Dr. HOLLOWON. We do not, under this act, intend to recover more than the costs which are specifically authorized. In no case do we intend to recover more than the costs.

Mr. WAGGONNER. If we allowed you to charge for your editorial comments, as you say you would in this particular instance—

Dr. HOLLOWON. Not more than our total cost. To the extent practical and appropriate, such prices may reflect the costs of collection,

compilation, and evaluation, but no more than that. We are not suggesting that we make a profit on this business.

Mr. WAGGONNER. 50,000 copies times \$15 is \$750,000.

Dr. ASTIN. The \$6.50 of that is the GPO's part. The only part that we could recover would be the part brought in in excess.

Mr. WAGGONNER. That leaves you \$8.50.

Dr. ASTIN. This particular handbook I am sure is a special case.

Mr. WAGGONNER. How many special cases will we have?

Dr. ASTIN. First of all, this is a mathematical handbook rather than a numerical data handbook, and costs associated with the preparation of this are relatively less than with the numerical data handbook.

Dr. HOLLOMON. That is, the amount of critical evaluation that is done is here insignificant. What you have here is essentially the compilation of tables.

Dr. ASTIN. Here is a numerical data compilation, the Selected Values of Thermodynamics. The cost of preparing this was about the same as the math handbook and it sold only 7,000 copies. It is a much more limited item. In general we will find that the number of customers for our numerical data compilations will be less than 10,000.

Mr. WAGGONNER. Mr. Chairman, since we are on this last section of Dr. Astin's statement, do you want to pursue it further or do you want to reach another starting point?

Mr. DADDARIO. Why don't we continue on this question of costs for a moment. I am sure Mr. Conable has a question. Mr. Conable.

Mr. CONABLE. In view of the fact that you have elected to charge some part of the intellectual costs involved in some of these things, don't you anticipate a serious problem of enforcement of 7(b)? Couldn't modest editorial charges be made in compilations that were made up and thus create a question of enforcibility that is going to be very difficult?

Dr. HOLLOMON. I had not anticipated that. The general purpose of being able to apply a mark was to give some assurance to the user that this data that had been critically evaluated was in fact a part of the National System and had met certain minimum standards with respect to it. That is the purpose of that particular section.

Now I think the question here is one of intent and interpretation. The purpose is to provide a mechanism so that compilations which meet certain minimum standards having to do with critical evaluation and so forth, whether done by NBS or someone else, can use a mark which identifies that evaluation.

Mr. CONABLE. The mark relates to 7(a).

Dr. HOLLOMON. Yes. The mark relates to 7(a).

Mr. CONABLE. 7(b) makes it illegal to copy any data compilation bearing the mark.

Dr. HOLLOMON. Yes. My view of that is the word "copy" might be clarified. I would suggest that you change it to "reproduce for sale." We do not intend to prevent the fair use of this material. That is not the purpose of the act. I think the question here is the word "copy," I would suggest that it be changed to "reproduce for sale."

Mr. DADDARIO. Dr. Hornig came to somewhat the same conclusions yesterday.

Dr. HOLLOWOMON. We do not intend to prevent anybody from copying by Xerox or some other means so that he may use the data at his desk.

Mr. CONABLE. Don't you anticipate there may be some commercial outfits that will want to provide, let's say, a portion of a major compilation?

Dr. HOLLOWOMON. Absolutely.

Mr. CONABLE. On a commercial basis?

Dr. HOLLOWOMON. This bill would permit them to do so, and the Secretary would grant them permission to use the mark so long as the compilations met the standards. I think this would permit private organizations, for example, to publish so long as they met the standards.

Mr. CONABLE. You would expect the Secretary then not to be at all sticky about giving written authorization?

Dr. HOLLOWOMON. Not at all. The whole point here is one of insuring that the scientific and engineering community understands that compilations of this sort have met the minimum standards of the National Bureau of Standards. It is not unlike the National Bureau of Standards giving a certificate with respect to a calibration service, saying that this calibration has been made and meets certain minimum standards of the National Bureau of Standards.

I would like to be sure it is in the record that the intent here is not at all to limit the degree to which private or public bodies may disseminate such information. In fact, we would intend to use the private publishing community to the degree to which this could effectively carry out the purposes of the act.

The thing we don't want to have happen, however, is for somebody in the backyard to put out a compilation and say that it is Standard Reference Data System material implying it has met the standards which we are all interested in, and sell it for that purpose. That is the intent of the legislation.

Mr. CONABLE. I simply wanted to be sure that the Government, in this case, wouldn't be getting a proprietary interest in a set of facts.

Dr. HOLLOWOMON. Absolutely not. The whole intent here is to try to provide a better mechanism of dissemination. It is not to restrict. It is to provide a mechanism so that we don't have a number of people providing compilations which imply or infer, or which can be deduced to be part of the System.

Mr. CONABLE. You referred to the selected values of thermodynamic properties. Have any private or any commercial treatises bearing on the subject been put out? You say that 7,000 copies of the book were sold.

Dr. HOLLOWOMON. Let me give you an example. This is what in a sense we are replacing, and I would like to make it clear so that the committee understands the problem. Replacing is a generic word because here we didn't have tapes and other things that we now have, and computers. The International Critical Tables were published by McGraw-Hill in 1929, and as I remember, having used it, I believe there are seven volumes.

Now this was a set of critical tables which would correspond to 400 volumes, or something of that order, if we had to reproduce it to-

day incorporating the kind of data that are now available. This was published privately, and there are similar kinds of publications today that exist that are privately published. They may or may not meet the standards which would have them included in the Standard Reference Data System. Now it is not our intention to restrict this. It is our intent to say, if these meet the standards that are set up and if they are appropriately evaluated as part of the system, they can still be published privately.

Mr. CONABLE. Do you anticipate that there would continue to be substantial private publishing?

Dr. ASTIN. Yes, I am sure there will be. We would hope to encourage the appearance of compilations produced by private means. The Manufacturing Chemist Association is supporting work in this area now, also the American Petroleum Institute. These we would encourage. We would cooperate with them, and to the extent that they are covering certain areas of science, we would not have to see that these areas are covered.

We would like to bring all these things together in an integrated system conforming to the same standards of quality so that we can facilitate the bringing together of a single national file where any data, any property can be located.

Mr. CONABLE. In other words, the establishment of your user charges is not intended to have any effect on possible competitive aspects of the private publishing?

Dr. HOLLOMON. No, just the converse. We would like to use this as a means of encouraging private publication where possible.

Mr. MOSHER. But, as a matter of fact, when you are publishing in an area and charging a user charge, it would pay the private publisher to compete with you?

Dr. HOLLOMON. We would try not to compete with private parties.

Mr. MOSHER. When you had a category that you wanted to publish, would you be asking for bids from private publishers?

Dr. HOLLOMON. I see no reason why not.

Mr. CONABLE. Mr. Chairman, one last question I would like to ask Mr. FARRAR who is the legal adviser for NBS.

Mr. DADDARIO. May the record show that Mr. Allen J. Farrar is accompanying Dr. Hollomon and Dr. Astin.

Mr. CONABLE. Do you see any problem of Government liability, since we are in effect saying these figures are reliable? It is demonstrable through the history of science that the reliability of figures deteriorates as we advance our knowledge. We are going to have to be constantly updating anything we do in this line.

Mr. FARRAR. I think, if I may, Mr. Conable, your question also implies in effect the Government guaranteeing to the user of the Standard Reference Data which is put out through this program as being accurate and, therefore, may be relied upon, and if in error the Government would be liable because of its having sponsored a program.

Mr. CONABLE. Yes.

Mr. FARRAR. I would have to say this. The only thing that the Government in a sense "guarantees" is the fact that the data has been critically evaluated, that it has gone through certain procedures, and certain standards were applied with regard to the analysis of the data

before it is permitted to have attached to it the symbol or mark which is provided for by the act.

Therefore, to that extent it may be considered as being reliable. But no scientific data, to my knowledge, can be said to be that reliable, that guaranteed, that pure, that a person may consider that it is not subject to question, that there may not be some updating or later knowledge which indicates that the information can be improved upon.

I don't think that the Government could be sued. I certainly don't think it comes under the Federal Tort Claims Act. I also don't believe it would come in the court of claims under the Tucker Act as a breach of contract. I don't know how—

Mr. CONABLE. In the compilations put out, will there be a specific exculpation to the Government or will this be simply an implied exculpation based upon the knowledge of scientific realities?

Mr. FARRAR. I think that the user of scientific data, Mr. Conable—I presume the question is still directed to me—recognizes the fact that scientific information and scientific data are always subject to question, and to that extent I don't think that he would require an exculpation clause. These are not Government contracts in the true sense.

Dr. HOLLOMON. I see no objection, however.

Mr. FARRAR. No; we would not be opposed to the inclusion of an exculpation clause in the publication.

Mr. CONABLE. Do you think it conceivable that people could bring action against the Government here on the grounds that the data was negligently prepared?

Mr. FARRAR. I think this would be an unconsented suit against the Government. It would not in my judgment fall under the Tort Claims Act unless the Tort Claims Act is subsequently amended to allow this type of thing. You can only maintain a tort action against the Government regarding certain specific activities, and I don't think this is one of them, sir.

Mr. WAGGONNER. I doubt if anyone would ever live long enough to see a case like that through the judicial process.

Mr. MOSHER. Just to get back to the basic philosophy of this bill for a minute and let me express some of those vague fears I mentioned yesterday, the very phrase "critically evaluated" implies an act of judgment on somebody's part. It is a judgment, in this case, between two figures or two sets of figures.

Dr. HOLLOMON. Or more.

Mr. MOSHER. Your testimony says that only a specialist in the field can tell which is most likely to be correct. That "most likely" seems very loose. How can you make this judgment without actually going into the laboratory and rechecking these figures? How am I to say that this scientist's figures are better than that scientist's figures?

Dr. HOLLOMON. That is one of the difficulties. Neither you nor I are very good at that. Let me try to describe what is normally done. Normally you get a group of qualified people to examine the data that are available, and the procedures that were used in the investigations that produced the data. The likelihood of errors of measurement develop as a consequence of having used inappropriate techniques in the past. In many instances, new techniques have been developed. What is usually done is the specification of a value with

likelihood of error around it, that is, this is the best value subject to the following variations of value.

Now the mechanism that is used is basically technical judgment. There is no question about that. But, while you and I might go in the literature and pick a particular reference and say this is the melting point of copper, the experts determine technically the degree of error that they believe possible in past measurements by evaluating all, or nearly all, of the past measurements. It is a judgment.

Mr. MOSHER. Experience indicates that the scientific community will accept this type of judgment if the scientific community has reason to believe that you have hired a specialist, that is, a good enough specialist. Do you have any problem in hiring adequately qualified people?

Dr. HOLLOMON. Or have it done under contract.

Mr. MOSHER. Right.

Dr. HOLLOMON. I don't think so. Let me make one other point, looking at this book at random. Here is a table of data having to do with certain oxide properties. One of the things that is done in this particular table, which is appropriate, is to say how the measurement was made. Then it gives the reference to that particular measurement so, if you wish to reassure yourself that the data judgment has been made properly, you at least can go back to the original source. That in itself is an enormous service. Someone has culled the literature and said, not only is this the best number, that is, 1705, but this was the way or the ways, the number was measured, and these are the people who made the measurements.

So you are not relying entirely upon the technical judgments. You are also providing the other worker, whoever he may be, an ability to make the judgment for himself.

Mr. MOSHER. This book doesn't say that Jones says it is 1705 and Smith says it is 1703?

Dr. HOLLOMON. In some cases, where it is impossible to make the technical judgment, in other words, where there doesn't seem to be any basis for the determination of the differences, then the best thing you can do is say these are the two reported values, heaven help you.

Dr. ASTIN. There are, however, Mr. Mosher, a few fairly straightforward things that can be done in addition to this very difficult technical judgment which must be exercised. First, the point that Dr. Hollomon mentioned, the method of measurement can be examined, and the expert would know through prior knowledge and experience whether this method of measurement may or may not have some defect.

Second, did the man who made these measurements make sure that the instruments he used were calibrated? This is a very important thing and one that involves us in our measurement standards activity. Unless the experimenter took pains within a reasonable recent time to make sure that each instrument he used had in some way been verified with respect to national standards, then automatically you lose confidence in the data.

Third, there are with many types of data rather straightforward analytical procedures one can use to see if the number in question is consistent with related properties for which we have well-established data. There are frequently analytical procedures that one can use

to check. So it is not all judgment. There are a few straightforward procedures to be followed.

Dr. HOLLOMON. When you are making a compilation you are aided in judging whether a value is consistent, because let's say, for example, you have a number of oxides of compounds, iron, copper, and so on, and properties vary from one to the other in some regular way, and all of a sudden the number appears that is highly irregular. The people who make compilations can see that because they are not only looking at this particular number but all numbers like it. In contrast, if you and I weren't doing this but were just trying to select the melting point of copper oxide, we would not be making a significant comparison between all other numbers.

So this in itself, the fact that you are making a compilation, provides a mechanism of determining self-consistency. That is another judgment that has to be made, the last one that Dr. Astin mentioned. But it really is judgment. I don't think one should be mistaken. It is judgment based upon the technical experience of people who are doing the job. All you can report is the best value in their judgment, and then also provide to the user the references so he himself may make a determination.

Mr. MOSHER. A great deal would depend on the people you are able to hire or contract for?

Dr. HOLLOMON. And the procedures which we will ask them to go through. That is: "How did you evaluate it?" "Did you determine whether the instruments were calibrated," et cetera.

Mr. MOSHER. And the scientific community will be watching you on this all the time?

Dr. HOLLOMON. Yes, sir. I hope they don't watch us too closely.

Mr. DADDARIO. Mr. Brown.

Mr. BROWN. I don't have any specific questions. Just as a comment, it seems to me that what we are really talking about here is involving the Bureau of Standards in the whole process of bringing system and order to the scientific community. This seems to me to be the most important aspect in the legislation. I, at this point, don't know whether to say this is good or bad. I can say this very definitely, that the scientific community needs to have a greater degree of integration and system brought to it beyond a shadow of a doubt. But whether or not moving into it through this device of Standard Reference Data on the part of the Bureau of Standards is the best method, I am not really clear on at this point.

Maybe you could offer some comment on it.

Dr. ASTIN. Mr. Brown, we are very much involved in the business of providing a basis for order in the entire scientific community, and this is why the National Bureau of Standards exists. Without a language in terms of which quantitative measurement can be reliably and compatibly defined, we would have chaos in science and engineering. We set up the basic standards for physical measurement first of all in order to assure that there is a basis for reliable exchange of quantitative data and devices. Moving into the field of evaluated data is merely an extension of the basic measurement activity into the information field. In other words, we are standardizing data just as we do measurements.

Mr. BROWN. I would differ with you only to this extent and I may be wrong in my conceptions. For example, take the function of the National Bureau of Standards with regard to the basic units of measurement. You put out data which involve the calibration of measurements of length, of time, of mass and so on. The National Bureau of Standards didn't invent any of these things. The standard and the method of determining it probably existed before the National Bureau of Standards did.

Dr. HOLLOMON. Let me make clear we did invent it. Let's take the case of the present method of measurement of time which uses a cesium clock. The basic standard of the second, which is based upon the frequency measurement of the cesium clock which the Bureau of Standards specifies as to the basic measurement that will be used for all scientific measure in the United States, and in fact now the world—

Dr. ASTIN. Tentatively, the world.

Dr. HOLLOMON (continuing). Has been developed in part, in very large part, by the Bureau of Standards. It is now working on a method to improve the measurement of frequency and time by methods which are different than that of the cesium clock. One of its consequences will be a very much greater accuracy in the determination of orbits of space vehicles, for example.

If that becomes the standard, the person who specifies that is the standard for the United States is the head of the Bureau of Standards.

Mr. BROWN. I won't argue this point. Nevertheless, you are still talking about the basic units of measurement. What we are moving into here is the application of the basic units of measurement to determine the secondary properties of everything in the universe.

Dr. HOLLOMON. That part of the universe which you can characterize. It is a narrow part of the universe.

Mr. BROWN. In effect, this is the whole field of science, and you are going to bring a system and order to it at the Bureau of Standards.

Dr. HOLLOMON. To the numerical values.

Mr. BROWN. Numerical values is all science is.

Dr. HOLLOMON. Not quite. I think you speak to a very important point. What we are trying to do is to provide in this vast area of data that they are self-consistent and that they are as available as can be. We are not trying in any way to impose anything on the people who wish to make the measurements.

Mr. BROWN. I still think that you are moving into the entire field of science and I am not criticizing it or saying it is good or bad. I am saying this is what you are doing.

Dr. HOLLOMON. I really think, Mr. Brown, that the organic act of the Bureau of Standards already put it there.

Mr. BROWN. I disagree with you because the organic act says now, and this is on the first page of Dr. Astin's statement, in paragraph 19, that you will compile and publish general scientific and technical data and so forth and the last clause "* * * are not available elsewhere." Now all of the material, that you are proposing to compile, is assumed to be available elsewhere, and you are going to evaluate it.

Dr. HOLLOMON. That is right.

Mr. BROWN. I am not sure doing that falls within the mandate which you have now which says "are not available elsewhere." I think we

are getting to the crux of the problem here, that you are going to expand the mandate of the Bureau considerably. Again, I reiterate I am not saying this is good or bad.

Dr. HOLLOMON. I believe the Congress should make this decision since this kind of service by the National Bureau of Standards, which is specified in section 4, to provide for more effective integration and so forth, is something which to some degree enlarges the function of the Bureau of Standards.

I would, however, also say that the organic act states that the compilation and publication of general scientific and technical data resulting from the performance of the functions specified herein, or what have you, lies within the authority of the Bureau of Standards.

We do believe, however, that just as the Bureau of Standards has the responsibility to insure the basic measurement system and other responsibilities in its act, that the Congress should authorize the full extension to the process of the critical evaluation of scientific and technical data. I think that is an extension of the responsibility of the Bureau of Standards. Otherwise we wouldn't be here.

Mr. DADDARIO. Mr. Brown raises an extremely important point that this bill is in a sense an elongation of the power. This comes about not because the data is available elsewhere; but because it is in such condition that it is not as useful as it should be; and because it cannot be done anywhere except within the Government. Furthermore, the Bureau of Standards has been chosen as the agency which can best do the job.

Dr. HOLLOMON. I think you state it well. Our feeling is it is not the question of the fact that the data exists, but the fact of the matter that it is not readily useful and available.

Second, the reason for the choice of the Bureau of Standards is that the degree of accuracy and the responsiveness and integrity of the Bureau of Standards in its normal functions give it the technical people and the viewpoint which no other agency of the Government has so far as I know.

Mr. BROWN. This was my original point, that what is being done by this legislation is to bring system and order, to what is admittedly chaos, throughout the whole field of science.

Dr. HOLLOMON. The whole field of scientific measurement, that is correct.

Mr. BROWN. All right, the whole field of scientific measurement.

Dr. HOLLOMON. If you add that, I am with you.

Mr. BROWN. There is an area of scientific philosophy which is excluded. Now the point that is significant is, Does the scientific community realize what is being done? Is there any significant divergence of opinion among the responsible spokesmen for the scientific community that this is the proper way to create this order and system in an area which badly needs it?

Dr. HOLLOMON. I can't speak for everybody. There are some disagreements concerning these questions which Mr. Conable and Mr. Mosher raised, with regard to the interpretation of what we mean by the mark and the copyright or what have you. I don't want to argue that point at the moment.

Mr. DADDARIO. You can add Mr. Vivian to the list.

Dr. HOLLOMON. If you let me have that exception, as far as I know, the need for a system of providing the process of getting standard reference data to the scientists and engineers of this country is generally accepted. We have been pressed very hard about it. I think I can safely say, that the scientific community, the President's Science Advisory Committee, the Federal Council, the American Chemical Society, and so forth, believe that this would be a helpful and appropriate function of the National Bureau of Standards. I don't want to go so far as to say everybody agrees with everything in this piece of legislation.

Mr. BROWN. As a liberal Democrat, I am becoming more and more sour with the idea of the Federal Government having total power in every field, because I see too many unfortunate situations arising therefrom. However, I don't want to use that as a criticism of this particular proposal, because this may well be the best way to approach this problem.

Mr. CONABLE. I would like to associate myself with most of Mr. Brown's remarks.

Dr. HOLLOMON. In my view this is being helpful to the scientific community in performing the service which I frankly don't see how else it can be performed.

Dr. ASTIN. The American Chemical Society took a poll of its membership on this problem a year or so ago and got a very good response. There was near unanimity in these responses from the members of the American Chemical Society that this is a program that the Federal Government, and specifically the National Bureau of Standards, had to get into.

Mr. DADDARIO. Mr. Vivian.

Mr. VIVIAN. I have a series of questions. I would like to say first that there is a great deal of agreement among the scientific people that some extensive operation by the Bureau of Standards is desirable and necessary. I don't think there is any question about that.

Also, I do think it is true that the Bureau of Standards has probably drifted away from the exact phraseology quoted in Dr. Astin's paper on the first page: "where such data are of importance and are not available elsewhere." I think it is probably true that you have, in fact, produced and tabulated data, which is available elsewhere, in a form that is far more satisfactory. I think perhaps the phraseology in the first part of this act which authorizes actions throughout without the reference "where not available elsewhere" is as useful to national purposes as the old phraseology.

If we went through this bill paragraph by paragraph, what new capability do you have?

Dr. HOLLOMON. I believe section 4 is new.

Mr. VIVIAN. Are you implying that sections 1, 2, and 3 are not new?

Dr. HOLLOMON. No. Section 1 states a declaration of policy. Section 2 is a series of definitions. Section 3, I believe, is clarification and extension. By this, I mean it makes it implicit that this is a function. This goes to Mr. Brown's point. It further insists, as a procedural matter, that this be done in cooperation and nonduplication, which I think is desirable.

Mr. VIVIAN. You are not changing the world as it now exists?

Dr. HOLLOMON. Section 4 in my view is new. We have not that responsibility, and I believe that it is new.

Mr. VIVIAN. This allows the Secretary to provide criteria for the publication by anybody else of standard reference data?

Dr. HOLLOMON. That is correct.

Mr. VIVIAN. Anybody else?

Dr. HOLLOMON. That is correct.

Mr. VIVIAN. You can prohibit the issuance of material by the Department of Defense?

Dr. HOLLOMON. No. The only thing we can say is it has to go through a process if it is to have that stamp.

Mr. VIVIAN. If it is to have a standard reference label?

Dr. HOLLOMON. That is correct.

Mr. VIVIAN. That label is a definition now which has a copyright context to it?

Dr. HOLLOMON. It has some of the characteristics of a copyright.

Mr. VIVIAN. In other words, the words "Standard Reference Data" cannot ever be used?

Dr. HOLLOMON. No, the stamp, an imprint, an imprint designed for cognitive purposes.

Mr. VIVIAN. What is the next new section?

Dr. HOLLOMON. The next new section is section 5. It has to do with the degree of recovery.

Mr. VIVIAN. It seems to me section 5 does not have to do with the degree of recovery. The first part of section 5 through line 16 deals with whether or not you have to go through the Government Printing Office.

Dr. HOLLOMON. That is correct.

Mr. VIVIAN. You presume it will still go through the Government Printing Office and still get a different recovery?

Dr. HOLLOMON. Yes.

Mr. VIVIAN. There are two requirements here?

Dr. HOLLOMON. Exactly.

Mr. VIVIAN. The two don't have to be necessarily together?

Dr. HOLLOMON. That is right. And this authority gives us authority to contract.

Mr. VIVIAN. Why is it necessary to change the laws relating to the Government Printing Office? Why should you go outside the Government Printing Office?

Dr. HOLLOMON. There are two aspects of the problem. One is the question of recovering user charges.

Mr. VIVIAN. I want to avoid that question right now.

Dr. HOLLOMON. That is one of them.

Mr. VIVIAN. Yes, sir.

Dr. HOLLOMON. I can't avoid it and answer your question. That is one of the reasons.

Mr. VIVIAN. Yes.

Dr. HOLLOMON. The second reason is that we believe, as I tried to answer Mr. Mosher, that it is appropriate in some instances and can be more effective to permit private publication of such compilations.

Mr. VIVIAN. Why isn't that true of the thousands of other things the Government prints? For example, how about agricultural pamphlets?

Dr. HOLLOMON. Mr. Vivian, I will try to answer a question with respect to these compilations.

Mr. VIVIAN. But the question is not only relevant to these publications.

Dr. HOLLOMON. I understand that. I am not trying to avoid the question. I have some feelings about these other matters, but I am not an expert in these other publications.

Mr. CONABLE. Nor is the Department of Agriculture within the proper cognizance of this act.

Dr. HOLLOMON. You may have some views on this, and it may be a very interesting question, but we believe there is a special reason—let's take the case that Dr. Astin spoke of. Suppose there is needed supplementary data to a particular private publication. If we wanted to make a supplement in the field, wouldn't it be appropriate to go to that publisher to see whether or not an appropriate arrangement could be made to issue a supplement through his standard distribution channels?

Mr. VIVIAN. It seems to me the question of whether all Government publications should go through the Government Printing Office at all is itself a question, because there are pretty stringent laws already existing requiring that they be published through the Government Printing Office.

Mr. DADDARIO. If you would yield, the example you have given, Dr. Hollomon, the means to get that done seems already to be available to you.

Dr. HOLLOMON. How?

Mr. FELTON. Under contract.

Dr. HOLLOMON. If we did all that work under contract, that would be so. But if the work happened to be done in the Bureau of Standards—

Mr. FELTON. I thought most of this work was going to be done out-of-house by experts in the field.

Dr. HOLLOMON. Both. We intend to do both. It depends on whether we have the expertise. Other Government agencies can do likewise. For example, AEC does certain publications that meet their criteria and some are printed privately at this time.

Mr. DADDARIO. I would like to say something for Mr. Vivian. I think his questions are excellent—help us put our thoughts together. He indicated yesterday a very strong support for the basic purposes of this bill. There is no antagonism.

Dr. HOLLOMON. I understand that. I don't mean to try to avoid the issue. I only say I don't think I should testify here on the general problems associated with all the things that the Government Printing Office does.

Mr. MILLER. If the gentleman may yield, he may not know it but another committee is taking great exception to this bill because it has charge of printing—says it is nothing but a printing bill. This is far from a printing bill. They are the committee that can put the type together, talk about what kind of ink should be used and where they should get the paper. Since the contents are beyond that committee, the bill is in our committee.

Dr. HOLLOMON. There is another presently modest, and perhaps crucial, part of this particular section which I think will become increas-

ingly important. That has to do with the problem of computer tapes, and also the service that one would render with a computer, for example, from a central data bank. I think in 10 years that much of the kind of data discussed here will be on tapes that will be in central computer banks, and I don't think these necessarily ought to be operated by the Government. This doesn't go to the printing problem now, this goes to the particular kind of service. It seems to me we ought to make such arrangements with private parties.

Mr. DADDARIO. You are not really talking about printing at all in this bill, but about how to compile, publish, and pay for it.

Mr. MILLER. It is the substance, not how the material is put in the book which we are talking about.

Dr. HOLLOWOM. That is correct. It is the problem of how do we devise the best mechanism to get this data with two characteristics which we want. One is that the user has some confidence that an appropriate evaluation procedure has been followed. The second is that he can get the data at a reasonable price.

Mr. DADDARIO. However, we are talking about today and not 10 years from now, and Mr. Vivian's questions are pertinent.

Mr. VIVIAN. I am not personally concerned about the question whether it is printed in the Government Printing Office or not. My concern is to show that the two sections are not necessarily together. The law says if it is printed and distributed by the Government Printing Office, the Government can charge up to 150 percent of the total cost of the printing, as I recollect, as a fixed limitation on cost.

Dr. HOLLOWOM. But it goes to where the funds go.

Mr. VIVIAN. The funds go back to the Treasury, which happens to be the place I believe it should go and which is why I don't want this section in here.

Section 6, I think we will agree is the ability of Commerce to establish a trademark.

Dr. HOLLOWOM. Yes.

Mr. VIVIAN. Is there any other place in the Federal Government where trademarks are defined and used? I am informed that Smoky the Bear is a symbol.

Dr. HOLLOWOM. It is.

Mr. VIVIAN. If there are such in existence, I will not question it. The answer is "Yes"?

Dr. HOLLOWOM. Yes, there also is a prohibition to using the words, "Federal Bureau of Investigation," or the initials "F.B.I."

Mr. VIVIAN. There exists a legal precedent?

Dr. HOLLOWOM. Yes.

Mr. DADDARIO. Can we fill the record out more?

Mr. VIVIAN. Sections 7 and 8 are the important sections of the bill. These I think are the ones that create for you a basically new authority, principally section 7(b), which you have already indicated you would change.

Dr. HOLLOWOM. Yes, and would clarify the intent.

Mr. VIVIAN. Is there any objection to publishing the data compilation or is it to the publishing of the mark?

Dr. HOLLOWOM. The bill would prohibit the publishing of data compilations using the mark.

Mr. VIVIAN. In other words, the data can be republished by anybody as long as the mark is not appended?

Dr. HOLLOWOMON. That is correct. That is all this bill says.

Mr. VIVIAN. Section 8 relates to a provision for penalties. Are there normally provisions of law by which a Secretary of a Department can send a man a bill and say, "Pay me a hundred dollars"?

Dr. HOLLOWOMON. Yes.

Mr. VIVIAN. Is this well established?

Dr. HOLLOWOMON. Yes. I have five precedents for that kind of penalty.

Mr. VIVIAN. In other words, the whole procedure for penalty as enforced by the Secretary is—

Dr. HOLLOWOMON. Has precedent.

Mr. VIVIAN. And the court provisions, section 9, are consistent with other provisions and other law relating to section 8?

Dr. HOLLOWOMON. Yes. And we will submit those for the record.

Mr. DADDARIO. Without objection, they may be submitted.

(The information requested is as follows:)

The committee has requested that it be furnished information pertaining to statutory precedents for the authority which would be granted under the bill relating to the adoption of a symbol or mark by the Secretary, the imposition of civil penalties for its unauthorized use, and obtaining an injunction to prevent and restrain violations of the Act.

In our view, there are a great many statutory precedents for the authority requested. Among the more commonly known statutes are 18 U.S.C. 709 relating to false advertising or misuse of names to indicate a Federal agency. That statute contains a prohibition pertaining to the use of the words "Federal Bureau of Investigation" or the initials "F.B.I." without the permission of the Director of the FBI. The statute is typical of those listed in Chapter 33 of Title 18, United States Code concerning misuse of emblems, insignia and names. Other statutory precedents on this point include 15 U.S.C. 1261-1273 relating to the labeling of hazardous substances; 21 U.S.C. 71-96 relating to the inspection and labeling of meat and meat products; 21 U.S.C. 301 and 321-392 relating to the requirements for, labeling of foods, drugs and cosmetics; 21 U.S.C. 457 relating to requirements for labeling of poultry products in interstate commerce; and 27 U.S.C. 201-212 relating to certificates for label approval of alcoholic beverages.

There are also statutory precedents for the authority prescribed in section 8 of the bill regarding civil penalties and the compromising of such penalties by the Secretary. Precedents for civil penalties are found in 45 U.S.C. 26(h) relating to railroads; 49 U.S.C. 322(h) relating to motor carriers, and 49 U.S.C. 1471 and 1473 relating to aircraft. Compromising authority exists in 49 U.S.C. 1471 and 1473. These authorities are also implemented by regulations in 14 CFR 13.15 and 14 CFR 302.800 et seq.

Statutory precedents for injunctions, which would be authorized under section 9 of the bill, may be found in 15 U.S.C. 1267 relating to hazardous substances; 21 U.S.C. 332 relating to foods, drugs and cosmetics; 49 U.S.C. 322(b) relating to motor carriers and 49 U.S.C. 1487 relating to aircraft. The latest example of such authority may be found in S. 3005, The Traffic Safety Act of 1966, which was passed by the Senate on June 24, 1966.

Mr. VIVIAN. I happen to object to these provisions, but I gather that they are not formally in precedent trouble.

Dr. HOLLOWOMON. No.

Mr. VIVIAN. Let me come back to another series of questions. What are the costs that you anticipate recovering when you charge for fees? For example, do you intend to charge for the research cost required to establish the data?

Dr. HOLLOWOMON. No.

Mr. VIVIAN. None?

Dr. HOLLOMON. No.

Mr. VIVIAN. Do you intend to include evaluation cost, whatever that may be?

Dr. HOLLOMON. Under some circumstances. I tried to answer this earlier.

Mr. VIVIAN. How do you differentiate between research and evaluation?

Dr. HOLLOMON. I think there is a sort of fundamental difference. In one case you go back to the laboratory and redo the number. That is what I thought you meant by research.

Mr. VIVIAN. In other words, you would never be going back to the laboratory?

Dr. HOLLOMON. Not from this standpoint. The Bureau of Standards does that, but not under this bill. It does that in any event at the present time. It frequently establishes numbers that are not otherwise established. One of the difficulties we have is to know which numbers are missing. This provides a mechanism of knowing which numbers are missing, but the activity to obtain new numbers would not be authorized under this particular bill. We already have the authority to do so.

Mr. VIVIAN. You don't need that authority?

Dr. HOLLOMON. That is correct. Furthermore, this bill doesn't go to the question.

Mr. VIVIAN. Under evaluation, do you include people who read technical documents, visit and investigate and do all the things required to getting a competence in numbers but not generating new numbers?

Dr. HOLLOMON. That is correct.

Mr. VIVIAN. Have you any concept at all how much that would cost?

Dr. HOLLOMON. Yes; we have made an estimate.

Mr. VIVIAN. You have issued three standard reference publications, in NBS-2, NBS-3, and NBS-4. The costs were something like 35 cents, 45 cents, and \$2.50 from GPO. If you had had this bill and it was in effect, what would the costs have been of those documents?

Dr. HOLLOMON. I don't know, frankly.

Dr. ASTIN. I frankly can't give it to you now.

Mr. DADDARIO. Could you make some estimate of that?

Dr. HOLLOMON. We could make a judgment and tell you what our judgment would be if this bill had been appropriate at that time.

(The information requested is as follows:)

PROPOSED PRICES FOR NSRDS PUBLICATIONS

The table that follows lists by title each of the three data compilations that have been published to date as a part of the National Standard Reference Data System. For each of these publications there is shown an estimate of the maximum total sales that can be expected, and the current price which the Government Printing Office charges for the publication. In addition, there is shown a maximum and a minimum sales price that might have been charge for these publications had they been published under the authority provided in H.R. 15638.

If the estimated quantity was sold at the minimum proposed price, it would be possible for NBS to recover all editorial and copy preparation costs as well as printing costs now paid to GPO. At the maximum proposed price, the cost of technical effort going into the compilation and evaluation of the data would also

be recovered. In no case would NBS expect to recover the cost of research to produce the raw data.

Since the three publications under discussion are considered to be primary publications containing basic data of interest and value to rather broad segments of the scientific community, a price close to the minimum proposed sale price would have been established in these cases.

Proposed prices for NSRDS publications

Title	Estimated sales	GPO sale price	Minimum proposed sale price	Maximum proposed sale price
NSRDS-NBS-2: "Thermal Properties of Aqueous Uni-univalent Electrolytes"-----	5,600	\$0.45	\$1.50	\$8.50
NSRDS-NBS-3: "Selected Tables of Atomic Spectra, Atomic Energy Levels and Multiplet Tables Si II, Si III, Si IV"-----	8,400	.35	.70	1.20
NSRDS-NBS-4: "Atomic Transition Probabilities, Hydrogen Through Neon"-----	5,600	2.50	4.50	37.00

Mr. VIVIAN. When you do a calibration of an instrument in the Bureau of Standards, what do you charge?

Dr. HOLLOWOM. We charge for all the direct costs of the calibration, that is, the actual out-of-pocket costs for the calibration. We charge overhead, including depreciation on the equipment that is used. And to some degree, but not fully, the necessary maintenance and recalibration that might be required for the calibration equipment. That is a minor amount.

Mr. VIVIAN. You do not charge for the long past history of research on the subject?

Dr. HOLLOWOM. No, we don't, and we would not here either.

Mr. VIVIAN. Suppose NSF runs a study on some particular area, are you going to try to recover any of NSF's cost?

Dr. HOLLOWOM. Absolutely not.

Mr. VIVIAN. NSF and DOD have paid you for various research efforts in the standard area, haven't they?

Dr. HOLLOWOM. No.

Mr. VIVIAN. Are you going to recover the costs of the ones that go back to the Bureau of Standards and not to the other agencies?

Dr. HOLLOWOM. No. I said in no event would we try to recover previous research costs.

Mr. VIVIAN. Haven't these other agencies provided you money recently? You have indicated I think \$21½ million out of \$4 million?

Dr. HOLLOWOM. Yes.

Mr. VIVIAN. That was used for the standards program?

Dr. HOLLOWOM. Yes.

Mr. VIVIAN. Isn't that standards money that you would ordinarily recover?

Dr. HOLLOWOM. If this bill is passed, there is no intention that those agencies would continue to furnish funds for this purpose.

Mr. VIVIAN. That is a reasonable answer. Concerning these charges, right now some \$20 billion of research is paid for in the United States of which \$15 billion comes out of the Federal Government.

Dr. HOLLOWOM. In round figures, right.

Mr. VIVIAN. Therefore, fifteen-twentieths, as a practical effect, in what you are going to collect in user charges is going to be paid by the Government anyway?

Dr. HOLLOMON. I don't know whether that is the case, but I don't think that is an inappropriate guess.

Mr. VIVIAN. I am quite sure it is about right.

Dr. HOLLOMON. But this way of collecting it you know whether or not it is useful and whether the researcher wanted to make a trade-off between using his Government funds for one purpose and using them for another. This, it seems to me, is a more appropriate way to pay for it than to give it away and have no test as to whether or not that data was useful.

Mr. VIVIAN. I am happy to have a charge made for the cost of the publication of the document and some auxiliary fees. I want to quote a witness:

Although these amounts cannot be estimated in advance with precision, our present estimates indicate that a significant, but not large, fraction of the total cost of operation would be recoverable.

I am quoting the man sitting next to you if you wish to dispute the statement.

Dr. HOLLOMON. No.

Mr. VIVIAN. It suggests that I apply to the fifteen-twentieths another fraction which is significant but not large, and I guess that is one-third. That would be one-third of the residual. That gets me up to about eighteen- to nineteen-twentieths is being paid by the Federal Government.

Dr. HOLLOMON. In one way or another.

Mr. VIVIAN. Now under the circumstances I frankly fail to see any merit of getting those last two-twentieths by the complex literature of the bill. I fail to see the merit of this residual benefit. I also quote to you a letter related to the subject of user charges and copyrights. Not long ago the Secretary of Commerce, through Robert Giles, General Counsel of the Department, testified before the House Judiciary Committee that the Department supports the language of the proposed bill relative to copyright protection. Then the report which came out from the Registrar of Copyrights states:

There are some cases in which copyright of the Government work would do no harm and might benefit the public, but these rare cases did not warrant the setting up the very elaborate procedures to evaluate.

It seems to me that for two-twentieths that phraseology is very appropriate. I don't suppose you want to argue with the Secretary of Commerce's statement through his General Counsel for copyright protection?

Dr. HOLLOMON. It seems to me we are seeking a specific exception to it by statutory exception.

Mr. VIVIAN. I disagree with you in the purpose.

Mr. DADDARIO. Why don't we put that in the nature of a question? Give us your answers to it.

Dr. HOLLOMON. Yes. In the first place, Mr. Chairman, we tried to explain earlier what the purpose of having such a mark was. This was not to restrict primarily but to try to give assurance.

Mr. VIVIAN. I am taking no exception to the use of the mark. I agree with it. I am taking exception to the method of charging relating to the mark.

Mr. DADDARIO. It is to that that I meant the question should be asked. Do you believe that the recoverable amount, using Mr. Vivian's figures, warrants its inclusion in this measure?

Dr. HOLLOWOM. There are two aspects of the problem which are separable. One is who recovers and how it is recovered, and Mr. Vivian has expressed a view on that subject. The second is how much can be recovered. I don't follow exactly the arithmetic of Mr. Vivian at the moment—I have no doubt about it but I just don't follow it. I believe that a fraction, and I said something of the order of 25 percent or more depending on the particular volume, should be recovered, and that it should be significant enough so that a judgment can be made as to whether or not the document is really useful. I believe this would be a desirable administrative feature, and further that the charges should be borne, to some degree at least, by the person who uses them so that he can make a trade-off judgment to determine whether he gets the data anew or buys a compilation.

Mr. VIVIAN. Once the compilation has been done within the Department or the Bureau of Standards, then the costs are already committed. Your real decision lies when you have decided to take on the effort to produce such a compilation.

Dr. HOLLOWOM. But there are other related compilations for which experience would determine the degree of utility by such a procedure. For example, if one would get the properties of semiconductors in a certain class and publish those, he could get experience from that with respect to semiconductors of another class.

Mr. VIVIAN. It seems to me the basic question you have to answer is, once you have made the compilation, and once the publishing effort has been done, from then on the reproduction costs is the only significant additional cost. Our purpose in this whole bill is not to limit information to users but to maximize it. Therefore, your main decision is when you decide to make the compilation. It is presumed that you will not make it on the basis of how many people will buy it but on the basis of the need for the information.

Dr. HOLLOWOM. Right.

Mr. VIVIAN. Having done that, I see no sense in charging higher prices for the document.

Dr. HOLLOWOM. What I was just trying to say was, there are similar documents for which experience can be garnered. Second, the question is whether or not, if we permitted private publication of these documents, a private publisher could recover his editorial cost.

Dr. ASTIN. Let me give what I think is another type of relevant example here. I think this authority would increase the usefulness and the degree of dissemination of our information. Suppose we are making a thermodynamic compilation and we put the data out oriented in a form according to the nature of the material in which the properties are described. This fulfills our responsibility of getting the information out. But we learn that there is a real interest in having the data reoriented and classified according to property. We put this out. If we are able to recover the costs of this type of operation, we are much more likely to do it than if it becomes a drain on our ability to perform our other activities.

Dr. HOLLOWOM. Suppose we put out this compilation right here, and you decided you would like to draw from this compilation all the

data on oxides and would like those in tables in a different form than you have now. You are the only fellow who comes in asking for this. Now I ask you, why shouldn't we be able to furnish that to you at full cost under those circumstances if you want to pay it, and not penalize appropriations which provided that document to the world at large?

Mr. VIVIAN. Are you restricted from doing that at the present time?

Dr. HOLLOWOM. Yes, if this service results in a publication.

Mr. VIVIAN. What do you do for the second person who wants the same compilation?

Dr. HOLLOWOM. It seems to me what you would have to do under these circumstances is to charge him with the full cost of reproducing that document. That is why I say judgment is involved in the matter. It seems to me you would have to allow some discretion.

Mr. VIVIAN. You want the first man to pay the full costs of the compilation?

Dr. HOLLOWOM. If he is willing to.

Mr. VIVIAN. To contract with you for the compilation of the document?

Dr. HOLLOWOM. Or somebody else.

Mr. VIVIAN. What about the second man?

Dr. HOLLOWOM. It seems to me it would be reasonable to anticipate there would be a second man in the first instance. If you were the only person, I think it would be only appropriate for you and Dr. Astin to find out if there were others who needed the data in that form, hopefully reproducing the copies and sharing the cost against those companies. If we had done that, the cost would be a fair share. If on the other hand, you were the only fellow we could find in a reasonable period that needed the data, we did the compilation, the master was set up, and then a second man comes in, I think he should bear the incremental cost.

Mr. VIVIAN. Such as the costs the Government Printing Office would charge?

Dr. HOLLOWOM. Such as that.

Mr. VIVIAN. My inclination is to support the bill if some statements as to the procedures to be followed would accompany the bill as legislative intent.

Dr. HOLLOWOM. Right.

Mr. DADDARIO. This is a matter for determination by the committee which, of course—

Mr. MILLER. It goes into the report.

Dr. HOLLOWOM. I think that is an entirely appropriate thing to do, Mr. Chairman.

Mr. DADDARIO. As I said yesterday, Mr. Vivian, we do not necessarily need to follow this language exactly. There will be I expect changes, and we will stress in the report those parts of the legislation which bothers the committee.

Mr. VIVIAN. At the present time there is a very large project, so-called Sigma project, in the AEC. Will they use this symbol and will you issue the documents?

Dr. HOLLOWOM. I don't know what the Sigma project is.

Mr. VIVIAN. The AEC collects a very large amount of data on the cross sections of various types of impact. These are voluminous, to put it mildly. Do you intend to reproduce these with a data symbol?

Dr. HOLLOWOM. If they meet the procedures, we would permit the AEC to put that stamp on their data.

Mr. VIVIAN. Now, at the present time, is that data issued by the AEC under the Government Printing Office?

Dr. HOLLOWOM. I can't answer the question, but in general experience AEC, I believe, has the authority to go to private contractors for printing. I believe that is the case.

Mr. VIVIAN. And presumably if there is any dispute between yourselves and the AEC over what data should have the stamp on it, you would have the authority to make the decision?

Dr. HOLLOWOM. No. The question is whether or not they follow a procedure, not a particular set of data. What we would do is have an interagency group look at how these standards and procedures would be set up. They would be published. Whether another agency could use the mark on its compilation would be determined on whether or not they followed the agreed upon published procedures. They don't have to if they don't want to.

Mr. VIVIAN. You would not review their actions but only the nature of the procedures?

Dr. HOLLOWOM. The procedures. That is all that could be done. To review every evaluation would be a prodigious job.

Mr. VIVIAN. At the present time this standard now would relate to that matter published in the United States. As you may know, there are many scientific documents now being reproduced in Hong Kong and other places and being sold at very low cost.

Dr. HOLLOWOM. Right.

Mr. VIVIAN. Is there any means that this could be prevented or at least not become troublesome?

Dr. HOLLOWOM. We suggested a revision of the wording with respect to section 7(b). Instead of the word "copy," "reproduce for sale." This, I presume, although I will have to talk to the lawyers about it, would prevent the sale in the United States.

Mr. DADDARIO. Let's not come to any particular decision about that.

Mr. MILLER. That is rather involved with regard to some treaties we may have with Britain and China, as to whether they can do this or not.

Dr. HOLLOWOM. I understand, Mr. Chairman.

Mr. VIVIAN. Will there be any compensation to copyright owners for material that is already in existence in other documents?

Dr. HOLLOWOM. The way this would operate would be that you have to ask, as you do in any case, whether or not data or things that were previously copyrighted could be used or whether they were already in the public domain.

Mr. VIVIAN. But you do concede that you could have such data marked by the mark and then possibly republished by some other publishing firm?

Dr. HOLLOWOM. Yes.

Mr. VIVIAN. It is conceivable that what came out of a journal or a document, a mark could be put on it, and under a contract by yourselves republished by some other publisher?

Dr. HOLLOWOM. Never in that form. Only as a number. Only as a number.

Mr. VIVIAN. Do these firms which publish these tables consider themselves as having any copyright to them?

Dr. HOLLOMON. Certainly.

Mr. VIVIAN. To the numbers themselves?

Dr. HOLLOMON. No, to the volumes.

Mr. VIVIAN. Therefore, you would not be violating their copyright interests?

Dr. HOLLOMON. I do not believe so.

Mr. VIVIAN. What amount of money do you anticipate to be asked of the appropriations committees as a result of the authorizations contained in this bill?

Dr. HOLLOMON. We believe that over a 4- or 5-year period, that the level of the expenses to operate the system will be on the order of \$20 million a year.

Mr. VIVIAN. Do you have a budget breakdown for that amount of funds?

Dr. HOLLOMON. Yes, we do.

Mr. VIVIAN. I would be interested in having that submitted, if it is available. That completes my questions.

Mr. DADDARIO. Without objection, that will be submitted for the record.

(The information requested is as follows:)

Estimated annual costs for SRDS program when fully implemented

By activity:	<i>Millions</i>
Standard reference data production.....	\$14.2
Information services operation.....	5.5
Office of Standard Reference Data.....	.3
Total.....	<u>20.0</u>
In-house versus contract:	
In-house	8.0
Contract.....	12.0
Total.....	<u>20.0</u>

Mr. YEAGER. One question for clarification, if I may. I think you have seen the letter which we have received from the Library of Congress Copyright Office.

Dr. HOLLOMON. Yes, I have.

Mr. YEAGER. It indicates that, in their opinion, they believe that section 7(a) of the bill seems intended to create the equivalent of a copyright which, unlike the present law, is free of the requirement to protect users and the public. The proposed copyright law says that copyright protection is not available for any work of the U.S. Government, and defines the work of the U.S. Government as being a work prepared by an officer or employee of the U.S. Government within the scope of his official duties. As Mr. Vivian mentioned, on the bill which is presently before the House Judiciary Committee, the Department of Commerce testified that this provision be retained.

Is there a conflict between what you are suggesting here and the previous testimony of the Department, or do you consider that section 7(b) does not, as the Library Copyright Office has suggested, amount to a copyright?

Dr. HOLLOWOMON. I don't know quite how to answer that question. I will answer in this way. We believe that what was proposed here and the degree to which it is an exception to the general statement of copyrights is appropriate. There should be, and can be, exceptions where demonstrated need exists. In other words, we don't believe that is inconsistent with the general proposition of the Secretary of Commerce. There are conditions in which exceptions should be made, but the exceptions should not be made administratively, but by statute, as is being suggested here.

The second question has to do with the limitation of time, as to the length of time. We would not object at all to being limited to some degree as to the time for which the stamp would be valid. The third question has to do with whether or not this is or is not actually establishing copyright. I assure you our intent was to be liberal but to maintain assurance. It was not to establish a Government monopoly in that sense. It has, however, in practice, I believe, a large number of the characteristics of a copyright.

So to answer your question as fairly as I can, I believe that to be the fact.

Mr. YEAGER. Thank you.

Mr. VIVIAN. I would like to inject a question there. Copyright on ordinary copy expires after some period of time and anyone is free to publish the document thereafter. Would this also apply to standard reference data?

Dr. HOLLOWOMON. That is right. The situation here is that if this system were fully established we would be revising such compilations periodically. We tried to say how frequently such a revision would be desirable or necessary, and, therefore, in that context we thought it would be appropriate to limit the time if the committee so desired.

Mr. VIVIAN. It seems to me some comprehension of the time role of the stamp is important. It is not obvious to me in this legislation or in my own mind at this point.

Dr. HOLLOWOMON. I tried to at least discuss that question. We tried to say how frequently we believe it to be proper and appropriate to revise the compilation, either to set them out in a modified form or re-evaluate them. We said something about 6 or 7 years. Therefore, 10 years may not be an inappropriate limitation.

Mr. VIVIAN. To use a mark which contains a date?

Dr. HOLLOWOMON. That is right. To use a mark which contains a date.

Mr. DADDARIO. Are there any further questions, gentlemen? If not, this committee will adjourn until 10 o'clock tomorrow morning at the same place.

ADDITIONAL QUESTIONS SUBMITTED TO DR. J. HERBERT HOLLOMON, ASSISTANT SECRETARY OF COMMERCE FOR SCIENCE AND TECHNOLOGY, BY THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND DEVELOPMENT

1. *In your testimony you stated that you would be amenable to a time limitation being placed in section 7 of the bill. Keeping in mind the fact that the International Critical Tables were obsolete after 30 years, what time limitation do you recommend to be placed in section 7?*

While we favor no time limit as set forth in section 7 of the proposed legislation, if the Committee believes a time limit is necessary, we suggest following the principles applied to the duration of copyrights.

2. *In your testimony you stated that ". . . some fraction of the cost should be recovered in order to have a measure of whether or not this is useful." Is it unreasonable to expect that the experts who advise the Bureau that standard reference data be compiled in a particular field also are capable to advise the Bureau if the compilation is of value to the scientific community?*

Experts advising the National Bureau of Standards in particular fields would be our primary source of advice on whether a particular compilation is of value to the scientific community. However, the independent approval implied by substantial sales at realistic prices would also be a real help to us. It would help us, for example, in describing our program and its value to non-scientific audiences. It would also help us by providing the less distinguished members of the scientific community with a way to give us an indication of their satisfaction. We have an obligation to the routine analytical chemist, the laboratory technician, and plant engineer who need standard reference data for some of their work just as much as do the leading scientists of this country.

Their needs may be somewhat different and the experts may not always be fully aware of just what those needs are. We can obtain some indications along these lines through the professional and technical societies, but, as I have indicated, the sale of a substantial number of volumes of a given compilation at more than token cost is a clear and impartial indication that the work is valuable. Of course, it should be understood that a small sales volume would not necessarily imply that the work was of little value. Some scientific topics are vitally important to a small audience only, and only a few copies of the tables might be sold. Nevertheless, those few workers might be making a very important contribution to science.

3. *If the Bureau contracted for the compilation and publication of standard reference data under its present authority, could the Bureau receive a royalty or similar payment on the sale of the publications or would such amount be taken into consideration in determining the amount of the contract?*

The Bureau could receive a royalty under section 278b (d) of title 15 of the U.S. Code, or could negotiate a contract price reflecting royalty consideration.

(a) *Has the Bureau ever received a royalty or similar payment on the sale of publications by a commercial publishing organization (other than rights which may have been acquired by assignment or bequest)? If so, under what circumstances?*

The Bureau has not received royalties. There are numerous instances when individual NBS staff members receive royalties or similar payments that they assign to the Bureau.

4. *In any situation does the Bureau expect to compensate copyright holders for the use or republication of copyrighted material?*

In the course of preparing compilations of critically evaluated data, the National Bureau of Standards and its contractors expect to make very substantial use of information which has already appeared in printed sources including books and in technical journals. Many of these sources are copyrighted. However, I believe that the present copyright law specifically recognizes that the purchaser of a book or journal is entitled to use the information which it contains, and even to excerpt portions of it for scholarly purposes and critical review. These are precisely the uses to which our compilers will put such copyrighted material.

With respect to republication for sale in some few cases, however, our compilers may find that an existing copyright document contains a particular table or graph which constitutes a most satisfactory and comprehensive assembly of data, already critically evaluated. It might be quite appropriate to present this table to our readers in its existing format. In such circumstances, we would seek permission to duplicate the material and would pay a reasonable fee if necessary, though past experience indicates this would seldom be required.

(a) If so, how will the amount of such compensation be determined, particularly if there is a disagreement?

Compensation may be determined by settlement negotiations pursuant to Section 1498(b) of title 28 of the U.S. Code. If settlement cannot be reached, that section provides for legal action by the copyright owner against the U.S. in the Court of Claims.

5. Since published standard reference data will not be copyrighted and therefore will not carry a copyright notation, how will publishers be put on notice that the publication may not be published for sale?

Procedures issued under section 4 can require appropriate notice, for example, by reciting relevant portions of the statute. However we would have no objection to authority to secure copyrights for standard reference data publications.

(a) Is the knowledge that one is doing a prohibited act necessary to the imposition of the fine under section 8?

Proof of knowledge is not required for imposition of a fine. However, the presence or absence of knowledge and the exercise of due care would be important factors in administrative decisions as to whether to seek imposition of the penalty and at what level to agree to compromise. If a compromise cannot be agreed upon, the courts would no doubt consider evidence of lack of knowledge or of exercise of due care in seeking the amount of a particular penalty.

(b) Should there be a clause requiring the Secretary to give notice in the compilation itself as to the restrictions placed on the use of the data appearing therein or the symbol or mark appearing thereon?

We would have no objection to such a clause under the principles of copyright. This would be done in any event administratively.

6. Under section 9, may a commercial publisher under contract to the Bureau bring an action to restrain violations?

No, unless by contract he has copyright. If no copyright is awarded under the contract however, a commercial publisher could request that the Secretary seek restraint of a violation.

7. What steps are being taken in private industry to collect such material and put it into data processing systems for more rapid retrieval?

Many industrial laboratories and engineering organizations maintain for their own use special collections of data on the materials of particular interest to them. In many cases these data compilations concentrate on proprietary products of the particular firm concerned. In other cases the data books describe all products that may be of concern to the particular organization's scientists and engineers, regardless of origin. Some of these organizations are now beginning to put such data into computers for rapid retrieval. The chemical manufacturing industry is perhaps most advanced in these activities. Scientists and engineers in these industries are extremely eager to obtain the products of the Standard Reference Data System to store in their own retrieval systems. Another industry in which computer techniques are universally employed for computations is the nuclear power industry. All nuclear power reactor calculations these days are made by computers. The data used in these calculations must be available on tape or in some other form of storage. The U.S. Atomic Energy Commission has for some years maintained an extensive activity whose purpose is to produce and disseminate compilations of neutron cross section data in the form of magnetic tapes. It is our intent to work closely in all fields with representatives of the Federal agencies and those industries which are in need of data in sophisticated processing systems.

(a) Will the activity of Commerce under the proposed bill interfere with this activity or discourage it by setting up competition through publication of "Standard Reference Data?"

The activities of the Department of Commerce under the proposed bill will encourage the establishment and widespread use of sophisticated data processing systems throughout industry. Our activities will help to make available such data to a large number of smaller industrial organizations which do not have

the internal resources to develop their own system themselves. There is little reason to believe that there will be competition from the Standard Reference Data System. Instead there will be coordination, standardization (in such matters as e.g., units, format, terminology), and reduction of duplication of effort. In addition, our early attention will be directed to the collection, evaluation, and distribution of data about substances of universal interest and applicability (elements and chemical compounds of general usefulness and highest possible purity). This information will therefore provide a common basis to ensure that specialized and/or private collections can be compatible with one another to whatever extent the users and owners desire.

8. *Is the Secretary to have authority to dictate the format to be used by other government agencies in compiling the data which such agencies develop for their own use?*

Under the proposed legislation the Secretary of Commerce would not have authority to dictate the format to be used by other government agencies in compiling the data which such agencies develop for their own use and that of their contractors. The responsibility of the Secretary is advisory in such matters. However, if the format or degree of evaluation of the data do not satisfy the standards established by the Secretary of Commerce, he would have the authority to withhold designation of such material as a product of the Standard Reference Data System.

9. *Would agencies of the Federal Government that make research and development grants, contracts, or other arrangements with individuals or organizations be required or encouraged to secure from the recipient a commitment to turn into the system data developed with Federal funds?*

We would encourage the agencies to participate in the system. However, it is not believed that a commitment is necessary because work supported by the government is normally published either in the report literature or in the open scientific journal literature. Indeed, unless specific data are available in some such fashion for the general scrutiny of the technical community, they would be considered to be inadequately documented for designation as standard reference data. Since the reporting of data acquired in research is a normal part of the scientific and technical process, special arrangements to be sure the data are made available to the operators of the Standard Reference Data System are not necessary.

10. *What percentage of the total annual cost of this program is expected to be recouped from the sale of standard reference data under section 5 of the bill?*

It is my opinion that approximately 25% of the total cost of the program might be recovered through user charges when the program is fully implemented, and assuming that there is as much demand for special information services as we anticipate.

11. *Since standard reference data is international in scope, what provisions in the bill would prevent a foreign organization from duplicating and selling the Bureau's Standard Reference Data outside the United States?*

(a) *Would section 7 be applicable to such activities, and could the Bureau attach assets of such foreign organizations in the U.S.?*

The bill, if enacted, would not have extra-territorial effect. There would be no authority in this legislation to attach assets of foreign organizations.

(b) *What recourse would there be under the bill if such a foreign organization distributed such materials in the U.S.?*

The remedy of injunction against violations of section 7 would be available to prevent such distribution. The availability of the civil penalty remedy would depend upon the facts and whether the U.S. had jurisdiction over the party.

(c) *What recourse does the Bureau have to prevent a domestic organization from printing and distributing standard reference data outside the U.S.?*

The remedies of injunction and civil penalty would be available against persons subject to the jurisdiction of U.S. district courts.

(d) *What advantages or disadvantages would the copyright laws and international agreements afford in above situations as compared to the bill?*

A copyright would be enforceable in other countries pursuant to international agreement.

12. *What appeal does a person or organization have from the provisions of section 8?*

(a) *If the violator refuses to compromise the claim, how will the Secretary enforce the penalty?*

The civil penalty would be enforced by civil action pursuant to 28 USC 2461, 2462. The action would be commenced in a U.S. district court. Appeals would be taken from its decision to the appropriate U.S. Court of Appeals.

13. *What happens to the penalties collected by the Secretary under section 8(a)?*

All penalties collected under section 8 would be deposited in the Treasury as miscellaneous receipts.

14. *What means is provided for judicial review of the action of the Secretary under section 8(a)?*

None, other than a refusal to pay and action for enforcement by the Secretary and Attorney General, at which time the court would decide the matter.

15. *Will the functions authorized by this bill be subject to the administrative Procedure Act (5 U.S.C. 1002)? If not, why?*

Yes, particularly with respect to the bill's functions relating to public information and rule-making.

16. *Does the term "a person . . . designated by him" as used in section 5 include a publisher with whom the Secretary has contracted to "publish" and "sell" the data?*

The term "a person designated by him" as used in section 5 is intended to include a publisher with whom the Secretary had contracted to "publish" and "sell" the data compilations produced in the program.

(a) *Does this section give a publisher the right to set the price? If not, who would set the price?*

The arrangements for setting the price for a particular volume would be included in the contract. Although the details have not yet been worked out, the procedure for entering into a contract with a publisher would probably be something like the following: After a manuscript was completed the publisher who had indicated an interest in publishing the particular work would be invited to a bidders conference to examine the manuscript. After the examination of the manuscript the publishers who wish to submit a proposal would do so. The proposal would contain such information as publishing schedule, price of the published work to the public, number of free copies to be given to the National Bureau of Standards, portion of the sales price that would be returned to the National Bureau of Standards, and related information. During the bidders conference the NBS would have the responsibility for cooperating with the publishers in estimating the size of the user public that a particular work would serve and would also inform the potential bidders how much of the cost of the production of the work the Bureau might wish to recover.

(a) *Would a publisher be given the right to copyright the publication in his own name?*

It is our intent to have the authority to give the publisher the right to copyright the publication in his own name, with a royalty-free use by the government guaranteed. This copyright would also protect the document from being reproduced and sold in other countries around the world without reimbursement to the National Bureau of Standards.

ADDITIONAL QUESTIONS SUBMITTED FOR THE RECORD TO DR. J. HERBERT HOLLOWOM
BY REPRESENTATIVE JOE D. WAGGONER, JR.

1. What evidence is there to suggest that the critical evaluation of standard reference data by National Bureau of Standards will result in a more accurate measured value for a particular property than that obtained by the original researcher or by another organization performing a similar function?

First, we do not think that the National Bureau of Standards has any monopoly on ability to perform critical evaluation of data. In fact under our projected plans less than one-fourth of the total compilation work would be done within NBS and the remaining three-fourths would be done at our request by others outside NBS—the most highly qualified specialists we can find who are willing to undertake the work. Even so, other equally qualified scientists, working independently of our program, might indeed do just as good a job as NBS-sponsored evaluators. If their products satisfy general criteria for critical evaluation, we would recommend the use of those results to our audience.

Second, as to the question of critically evaluated data being better than the original researcher's measurements, we feel that critical evaluation by a second party should lead to greater reliability than the original measurement, for several reasons. There frequently are disagreements among published research reports as to the correct numerical values for physical properties. Critical evaluation resolves such disagreements by analyzing the original results for possible errors, for use of materials of inadequate purity, for assessment of experimental techniques used, and apparatus employed. The man who does the evaluation must be as good at the work as the scientists whose work he is evaluating.

Further, he is in a position to apply his judgment with greater impartial attention to all the factors involved. He can go back to early work, done by experimentalists of outstanding capability, and adjust their results to take into account more recent values for atomic weights, fundamental constants, temperature scales and so on. Finally, the program of the Standard Reference Data System will provide for systematic, continuing projects by which regular updating of results will be emphasized, so that the whole network of data will be self-consistent and uniformly reliable.

2. On page 4 of your prepared statement you speak of duplicating the work that has already been done as being "undesirable." Isn't it a fact that it is this duplication which provides the basic data which the Bureau will evaluate, and if such duplication results in two researchers independently obtaining the same value for a particular property, it would tend to prove the reliability of that value?

Duplication of experimental measurements is unavoidable to a certain extent, and as you suggest, duplication does provide the basic data which the Bureau will evaluate. However, when a new measurement is made merely because the presently available results do not agree, or because it requires too much searching of the literature to find those results, then, I feel, that the new measurement is indeed undesirable duplication.

Duplication of critical evaluation efforts is also undesirable. One of the responsibilities of the NBS Office of Standard Reference Data is to make itself aware of all critical compilation projects which are active or contemplated within the Federal Government and elsewhere, and to advise the sponsors of any new project about possible duplication of an already active project.

Voluntary cooperation by privately sponsored compilation projects will allow NBS to advise such sponsors of possible duplication as well, although of course there would be no attempt made by NBS to require any private concern to refrain from doing as they saw fit.

3. On page 3 of your prepared statement you mention the necessity for updating standard reference data. After the Bureau's program becomes fully operational,

how often will the published material be updated, and what percentage of the overall effort will be devoted to such activities?

Compilations of standard reference data will be updated as frequently as the appearance of a significant quantity of improved experimental results and users' demands for more precise information require it. The time scale will not be uniform. In some cases it might be within six months and in others it might not be for five years or more. Some fields of science are moving very rapidly and frequent updating would be in order. This is especially true where expanding technological interest and more extreme demands lead to the development of new materials, higher or lower temperatures of operation and the like. Updating a compilation means adding completely new numbers, as well as changing existing numbers. In other fields progress is much slower, experimental techniques are not changing, and results of two years ago are just as reliable as those measured last month. Modern data and information handling capabilities will ensure that updated material can be inserted into a computer-based storage system, so that the whole file can be modified as promptly as important new results appear which call for an addition. When the program becomes fully operational, that is, when there are ongoing projects taking care of 90% to 95% of the high priority needs, we anticipate that $\frac{1}{4}$ to $\frac{1}{2}$ of the overall effort will involve updating of published material. It should be realized that in many cases the data in a particular area are so interrelated that any substantial amount of new material will call for a reassessment of an even larger amount of old material.

4. In his prepared statement Dr. Astin referred to the system as the "National Standard Reference Data System." You referred to it in your testimony as the "Standard Reference Data System." What will the system be called, and is there some reason why you omitted the word "National"?

We are talking about the same system. Dr. Astin, as Director of the National Bureau of Standards, was given certain administrative responsibility by the Federal Council for Science and Technology under a Federal Policy Statement which specifically referred to the National Standard Reference Data System. The end product of our own efforts will be Standard Reference Data, and the numbers themselves and their use will know no national boundaries. That is why H.R. 15638 is called the "Standard Reference Data Act." The system which Dr. Astin will continue to administer is appropriately entitled the National Standard Reference Data System, but in the broader sense, the total effort cannot be confined to a single nation.

5. On page 10 of your prepared statement you state that "identifiable customer groups should be required to bear the costs of specialized Federal services provided in their behalf."

(a) In effect, aren't all government services specialized, and since the taxpayer pays for the cost anyway, why should he be required to pay an additional cost?

He should be required to pay an additional charge because he is receiving a service from the Government which is of more benefit to him than to the taxpayer who does not receive the service. The principle that the user of special Government services should pay for them is set forth explicitly in Title V of the Independent Offices Appropriation Act of 1952 (5 U.S.C. 140). It is official executive branch policy. Bureau of the Budget Circular No. A-25 provides that user charges should be imposed to "cover all Federal activities which convey special benefits to recipients above and beyond those accruing to the public at large." This certainly applies to the specialized services which are provided to the well-defined select group of users to whom standard reference data are a matter of day-to-day concern.

(b) You further state that the Secretary would apply the above principle to "certain specialized information services that we propose to provide." Does this indicate that additional charges would not apply to a publication such as NSRDS-NBS4 but that it would apply if an organization requested, for example, the information on a special computer tape? Why wouldn't the service charge authorized by 15 U.S.C. 275a cover this type of situation?

We believe user charges should be applied to all products of the Standard Reference Data System, since all such services convey a special benefit to the user. Due to cost and value differences, the charges would necessarily vary

for providing different information or for providing the same information in a form which is more adaptable to the needs of the particular user.

In the case of primary publications, such as NSRDS-NBS4, the additional charge would usually be minimal; designed primarily to recover editorial, composition, printing, announcement and distribution costs.

In the case of secondary publications (which involve the reorganization or extraction of material already available as primary publications to serve the special needs of particular user groups), we would attempt to recover the costs mentioned above plus those associated with the selection of material and any additional evaluation that might be required.

With regard to special custom services, such as answers to specific inquiries or special print-out of computer stored data, we would normally expect to recover the full cost of providing the additional service. In most instances this could be done under the authority provided through 15 U.S.C. 275a since the end product would not be a publication.

6. On page 10 of your prepared statement you state that the "symbol will stand as a signpost of quality." (a) Does this infer that any material without the proposed symbol is of inferior quality?

Use of the symbol as a signpost of quality is a positive matter only. There will always be a great deal of very valuable numerical information on physical properties which will not carry the proposed symbol. Some of that information will be completely outside the scope of the Standard Reference Data System, while some will simply not have been subjected to the evaluation process. No one should infer that the absence of the symbol means inferior quality, in the general case. There will be certain circumstances in which a more recent publication carrying the proposed symbol would supersede and clearly replace an earlier compilation. In such circumstances it is indeed true that the absence of the symbol on the older material and its presence on the newer, should convey to the user a warning that a better source of data is available.

(b) Since the symbol will stand for a definable standard of quality, why not just print the words on each publication instead of using a symbol since there then will be no question of misunderstanding?

The use of a phrase or sentence to be printed on each publication would perform the same function as the symbol; however, the use of the symbol permits more immediate identification, particularly when the average page of data is filled with printed words and numbers already.

7. How many additional personnel will the National Bureau of Standards require to carry out the functions envisioned in H.R. 15638?

At full operation, the National Bureau of Standards will require about 110 additional people to carry out the functions envisioned. Fifty of these would be concerned with the Information Services described on page four of Dr. Astin's statement and which we hope to provide within the Office of Standard Reference Data. Ten additional staff members will be needed in managing the technical area programs. In addition 50 new people will be employed doing in-house compilation work in areas where the National Bureau of Standards has obvious responsibility and an already developed competence to do the work; another 50 present employees might be reassigned as some current programs now supported by funds transferred from other agencies are phased out.

(a) If additional facilities are needed, what are they and what is their estimated cost?

The major additional facility needed at the National Bureau of Standards will be a large capacity automated system for the storage, retrieval, and analysis of data which will be developed under the various individual projects. Such a system will probably cost \$1.5 to \$2 million.

(b) Please provide a detailed breakdown of how you arrived at the estimated \$20 million annual cost of the program?

Tables I and II attached provide a breakdown of the present and estimated annual cost of a fully operational program. Also attached is a statement of the basic assumptions that were made in the development of these estimates. It should be noted that these recent estimates assume the availability of authority to impose user charges. As a consequence, the amount shown for Information Services Operation is substantially less than indicated in earlier estimates.

(c) Would it be agreeable if section 10 of the bill limited the authorization to not more than \$20 million per annum? If not, why?

The projected level of activities of the Standard Reference Data System could be operated quite satisfactorily for the next few years under such a ceiling. However, in view of the numerous uncertainties associated with a new program of this magnitude and the constantly rising costs of scientific endeavors, it might be simpler from an administrative point of view if no dollar ceiling were explicitly stated.

Whether or not any dollar ceiling is authorized, we would welcome the opportunity to report frequently to the Congress on the general progress of the Standard Reference Data System and on its financial status.

8. *Will the standards of quality which you intend to publish in the Federal Register in any way require that in order to meet the quality standards for standard reference data, the experiments or other calculations will have to be performed with equipment calibrated by the National Bureau of Standards?*

No such requirements for calibration will be made because, as a practical matter, it can't be done. As a matter of practice, most scientific experimenters who concern themselves with high precision measurements use techniques, instruments and materials which can be traced back (usually in a very direct manner) to some aspect of the traditional services of the National Bureau of Standards for standards, calibration, standard reference materials and measurement methodology. However the Standard Reference Data System is primarily concerned with proper processing (collection, evaluation, and dissemination) of experimental results after they have been reported in the scientific literature. For the operations of the system, therefore, such requirements are not needed.

9. *Could the functions envisioned by this bill simply imply an effort on the part of the National Bureau of Standards to enlarge its domain and field of bureaucratic influence?*

The proposed bill is intended to clarify the role of the Department of Commerce in providing the standard reference data needed by our nation's scientific and technological community. It clearly will recognize the responsibilities of the Secretary of Commerce by directing him to provide national coordination and integration of standard reference data activities through the establishment of standards and criteria for the preparation and publication of these data.

The bill represents no particular enlargement of the types of activities to be performed by the Department since the National Bureau of Standards has a long history of involvement in this field. It is because of this existing competence that NBS has been selected, with the recommendation of the Federal Council for Science and Technology, to administer the increased responsibilities the bill will place on the Secretary for coordination of a national standard reference data system.

TABLE I.—Preliminary projection of NSRDS program costs

[Millions of dollars]

	Fiscal year 1965	Fiscal year 1966	Fiscal year 1967	Ultimate level
I. Standard reference data production:				
A. Nuclear data.....	0.04	0.04	0.07	1.60
B. Atomic and molecular physics data.....	.41	.43	.50	2.71
C. Thermodynamics and transport data.....	.60	.58	.62	3.71
D. Solid state.....	.10	.14	.13	1.83
E. Chemical kinetics.....	.16	.12	.18	1.40
F. Colloid and surface properties.....	.04	.02	.13	1.20
G. Mechanical properties of materials.....			.07	1.20
H. Other areas.....				.60
II. Information Services Operation:				
A. Information research.....	.07	.05	.10	1.00
B. Information services.....	.02	.05	.26	2.77
III. Office of Standard Reference Data.....	.05	.07	.09	.20
IV. OCT (NAS Office of Critical Tables).....		.04	.08	.10
Total.....	1.49	2.54	2.23	18.32

¹ Includes 330K OA funds (transferred from other agencies).

² Includes 380K OA funds.

TABLE II.—*Preliminary projection of NSRDS program costs*

[Millions of dollars]

	Office	In-house compila- tions	Compila- tions through contract	Total
1965.....	0.28	0.63	0.58	¹ 1.49
1966.....	.28	.38	.88	² 1.54
1967.....	.50	.47	1.26	2.23
Ultimate level.....	3.95	3.53	10.84	18.32

¹ Includes 330K OA funds.² Includes 380K OA funds.

JUNE 16, 1966.

BASIC ASSUMPTIONS USED IN DEVELOPMENT OF FIVE YEAR FINANCIAL PLAN FOR
THE NATIONAL STANDARD REFERENCE DATA SYSTEM

In developing the five year projection for the needs of the National Standard Reference Data System the following assumptions were taken as basic ground rules:

- (1) That competent individuals can be located for data compilation projects.

Up to the present, the program has been limited by the availability of financial resources. At some stage the availability of competent persons will become the limiting factor on further expansion. There is no way to tell at present whether this limit will be reached at a level which is 2, 4, or 10 times greater than the present.

- (2) That only higher priority projects would be supported during the next five years.

In each technical area it was assumed that 100% coverage of all types of quantitative data would probably not be justifiable on a cost benefit basis and therefore, that only the areas judged to be of urgent or high priority would be covered.

- (3) That the technical scope of the program would remain essentially constant.

No extension of the program to data on partially defined materials or on structure sensitive properties was envisioned in developing the 5-year projection.

- (4) That user studies would show that sophisticated storage and retrieval systems are justified on a cost benefit basis.

A relatively large fraction of the estimate for office expense is associated with putting data into computerized storage and with the development of software for retrieving the data in a variety of ways. Costs for hardware and for communications equipment are also included.

- (5) That information services would be established using appropriated funds, with user charges beginning to be an important factor only toward the end of the five-year period.

Under this assumption the costs associated with the development of information services would be borne by appropriated funds. User charges would cover only out-of-pocket costs associated with specific service requests.

ADDITIONAL QUESTIONS SUBMITTED TO DR. ALLEN V. ASTIN, DIRECTOR, NATIONAL BUREAU OF STANDARDS, DEPARTMENT OF COMMERCE, BY THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND DEVELOPMENT

1. *If an individual, organization, or agency does not consent to the Bureau's use of their reference data services or materials as provided in section 3 of the bill, what action will the Bureau take in such a case?*

The National Bureau of Standards will promote and encourage voluntary participation by all concerned. If any individual, organization, or agency does not wish to make its data resources available to the National Bureau of Standards for incorporation into the National Standard Reference Data System, no attempt will be made to coerce them into doing so. Participation is entirely voluntary with the consent of all participants. If an industrial organization has a body of data which they do not wish to make available to the System, that is entirely their own choice. Again, if a data compilation does not meet the standards of the NSRDS but its compilers and users do not object because the work in its present form satisfies their requirements, this is their prerogative. If the topic is important enough to other users to justify additional action being taken, the operators of the National Standard Reference Data System would attempt to produce a compilation on the same subject that does meet standards.

2. *Is it intended to "integrate" and "coordinate" privately prepared and published data without the participation of private concerns in the rulemaking process?*

The intent of the Department of Commerce is that no action will be taken with respect to privately prepared and published data without the participation of and consent of individuals responsible for the data. The program is to be entirely voluntary and cooperative. In addition, since the whole system is user-oriented, every effort is being made to give users of data a chance to voice their interests, so as to provide guidance in selection of content and format of projects.

3. *Since Standard Reference Data is international in scope, please describe the efforts going on in other countries, and in particular the work of the International Council of Scientific Unions and the Soviet Union's State System of Standard Reference Data.*

The International Council of Scientific Unions has recently established an International Committee on Numerical Data for Science and Technology in order to assist the national efforts in several countries to maintain better contact with each other and to promote the expansion of this type of activity throughout the world. The Chairman of this Committee is Dean Frederick Rossini of Notre Dame University. Dean Rossini is also the Chairman of the general Review Committee for the NBS Office of Standard Reference Data and similarly is Chairman of the Executive Committee of the Office of Critical Tables of the National Academy of Sciences-National Research Council. He has been a leader in scientific data compilation work for many years.

Last year the Soviet Union established a State System of Standard Reference Data, patterned in many respects after the plan of the National Bureau of Standards. The Soviet plan of operation apparently envisions a much more extensive experimental program than does the NBS program. In the U.S.S.R. central direction is to be provided for experimental measurements of the properties of substances of all kinds, in addition to the central coordination and direction provided for data compilation activities. The Soviet program also apparently envisions coverage of a considerably wider scope of science and technology than does the present U.S. program.

Several of the more advanced countries of the world have active data compilation projects in various fields, some under government auspices and some private. In the United Kingdom, the Department of Education and Science has established an Office of Scientific and Technical Information, one of whose functions is to promote data compilation activities in the U.K. A French

organization has had a small but effective program for many years. A small group in Germany has organized the most effective and comprehensive privately sponsored program in the world. This program (The Landolt-Bernstein Tabellen) has been in existence since 1883. In Japan considerable interest has been expressed as a result of discussions held under the U.S.-Japan Scientific Exchange Agreement.

(a) How is coordination effected between such international organizations and the National Bureau of Standards?

The principal channel for coordination between multi-lateral international organizations and the National Bureau of Standards is through the National Academy of Sciences and its Office of Critical Tables. The Office of Critical Tables has been in existence since 1957 and has established relationships with most of the effective working groups throughout the world. The Director of the Office of Critical Tables has recently undertaken an additional responsibility to be part-time director of the staff of the new ICSU International Committee on Numerical Data for Science and Technology. The staff office is to be located in Washington, D.C., in housing provided by the National Academy of Sciences for the initial few years of existence of the Committee, after which time it is to be removed to a yet-to-be-determined location in Western Europe.

Additional contact and coordination with the ICSU activity is provided through the activities of Dr. Frederick Rossini, Dean of Science at Notre Dame University, who as already mentioned, serves as Chairman of the ICSU Committee as well as Chairman of the NBS general Review Committee. Liaison with activities in other countries is also maintained through occasional visits of members of the staff of the National Bureau of Standards to important projects in other countries and similar visits by active workers in other countries to the National Bureau of Standards and to the individual data compilation projects under NBS auspices.

(b) What role does the State Department play in these international activities?

Foreign policy guidance would be expected from the State Department. The State Department Office of International Scientific Affairs has encouraged the development of international cooperative activities in this field. Members of the staff of this State Department Office are kept informed in full in the development of such activities but in general do not participate in the scientific meetings that are held. In addition, the Science Attaches of the United States, and those of other countries stationed in Washington, often provide communication channels between individuals and groups in the active countries.

4. To what extent have other Federal agencies financially supported the Bureau's standard reference data system and is such support expected to continue in the future?

First year support for the National Standard Reference Data System was provided by contributions of \$200,000 each from four other government agencies—DOD, AEC, NSF, and NASA. During FY 1966 the Department of Defense provided an additional \$300,000 and the NASA an additional \$100,000 for general support of the program. Beyond that other government agencies have supplied smaller amounts of support for specific data compilation projects to the following extent: ARPA 150K and AEC 118K.

In addition, the Atomic Energy Commission, the Department of Defense, and the National Aeronautics and Space Administration have a number of high quality data compilation projects in special areas. This support has not gone through the National Bureau of Standards but does lead to the production of compilations of data which are part of the system.

5. Page 249 of the Appendix to the Federal Budget for Fiscal Year 1967 shows that \$7.4 million was spent on Standard Reference Data in Fiscal Year 1965; an estimated \$8.2 million will be spent in Fiscal Year 1966, and that the Bureau is requesting \$9.1 million for Fiscal Year 1967. (a) Do the above amounts represent the Bureau's funding of the system as envisioned in H.R. 15638? If not, please discuss where the dividing line exists in terms of work or functions performed?

The amounts listed in this question include two major categories of activities within the National Bureau of Standards: (a) the projects of the National Standard Reference Data System and (b) experimental measurements of properties of the kind that provide input to the compilation projects of the NSRDS.

Naturally these experimental measurements serve other functions as well as supplying input to the NSRDS. They provide key data for the measurement system, they are a vital part of the programs for development of measurement techniques, and are part of the recognized mission of the NBS. For Fiscal Years 1965 and 1966 the funds appropriated by Congress that were employed in the activities of the National Standard Reference Data System (that is, those of the type envisioned in the proposed Standard Reference Data Act) were \$1.16 million for each year. The balance, outside of the scope of the National Standard Reference Data System, was spent in activities of type (b) mentioned above, that is, experimental determination of important properties of substances.

The activities of the National Standard Reference Data System provided guidance for the experimental work in the determination of the properties which needed to be measured either because measurements were lacking or because higher precision was required.

6. *Will the functions authorized by this bill be subject to the Administrative Procedure Act (5 U.S.C. 1002)? If not, why?*

Yes—particularly with respect to the bill's functions relating to public information and rule-making.

(a) *Is the purpose of section 4 of the bill in implementation of, rather than in lieu of, section 3 of the Administrative Procedure Act as modified by the House on June 20, 1966?*

Section 4 of H.R. 15638 implements, but does not replace section 3 of the Administrative Procedure Act. The section also provides the Secretary with explicit authority to issue standards, criteria and procedures for the preparation and publication of Standard Reference Data.

7. *In what form is it intended that the data be "published," and how frequently will it be updated or supplemented?*

The compilations produced by the various components of the National Standard Reference Data System will appear in various forms: monographs, books, loose-leaf data sheets, decks of punched cards, magnetic tapes, microfiche, and perhaps other forms as well. Any form which the users of the data would find to be convenient for their purposes would be considered appropriate for the program. The frequency of updating depends upon the rate of activity in the area under consideration. In some areas it might be as often as every six months, in others perhaps a frequency of updating of once in three or four years might be quite adequate. This, too, depends upon the needs of the users.

(a) *How does one publish computer tapes or cards and what section of the bill authorizes the sale of such materials?*

Computer tapes are not published in the same sense that books are. Instead, a duplicate of a master tape is prepared by running the master plus a blank tape through an appropriate machine. Several slave-stations can be controlled from the one master station, so that up to ten copies could be made at once. Essentially, this is a custom service operation.

Card decks are duplicated similarly by running a master deck through a duplicator-puncher, which senses the holes in the master cards, and punches corresponding holes in the duplicate cards. The duplicator-puncher can also be controlled by a magnetic tape or a punched paper tape. It is intended that section 5 of the proposed Act cover standard reference data in these forms as well as in the form of a printed page.

8. *Has any published material of the National Bureau of Standards ever been duplicated or reprinted by a commercial publishing organization?*

(a) *If so, what percentage would this be of the total material published by NBS?*

The percentage of the Bureau's published material that has been reprinted by commercial publishing organizations is low, but this has occurred on occasions. The most recent examples we are aware of are the 1046 page "Handbook of Mathematical Functions" that was duplicated by Dover publications, Inc., and the 478 page "Tables of Thermodynamic and Transport Properties of Air, Argon, Carbon Dioxide, Carbon Monoxide, Hydrogen, Nitrogen, Oxygen, and Steam," copied by Pergamon Press Ltd. We understand that a commercial publisher currently is considering duplication of the 470 page monograph, "Inospheric Radio Propagation."

(b) *Was the material duplicated in such a way that the public might believe it to be a publication of NBS rather than the publishing company?*

We are not yet aware of any problem from this source.

(c) If a commercial organization attempted to fraudulently pass off its duplicated material as a publication of NBS, wouldn't the normal legal remedies be available to the government in such a case?

If it is clear that the method of sale of the duplicated material was intended to deceive the public, the matter could be referred to the Federal Trade Commission or the Attorney General for consideration. Additional remedies may also be available.

(d) In light of the above questions, why are the enforcement provisions of this bill necessary to protect the integrity of standard reference data system?

Up to the present time, we have had no authority to recover our costs through the sale of publications, and the low price of Government publications has discouraged duplication by commercial publishers. If higher prices are charged, as proposed under H.R. 15638, more frequent and perhaps irresponsible duplication can be expected. The enforcement provisions of the bill are intended as a safeguard against this eventuality.

9. In determining the price to be charged for standard reference data, does the Bureau intend to charge the same price per publication to both foreign and domestic users? If not, please explain.

Yes, except for any extra costs incurred in supplying them to foreign users.

(a) What percentage of the overall sales do you expect to receive from foreign purchasers? Is this estimate based on past experiences?

Overall sales to foreign purchasers might total 30% to 50% of total sales. This estimate takes into account the experience of U.S. and foreign technical book publishers.

10. What percentage of the purchasers of standard reference data do you expect to be institutional purchasers (corporations, libraries, etc.) and what percentage do you expect to be individual purchasers?

Institutional purchasers, such as corporations, libraries, etc., would probably account for approximately $\frac{1}{2}$ of the sale of standard reference data. In many cases, however, some of these institutional purchases will include multiple copy orders for the use of individuals within the organization.

11. Please discuss to what extent computers are currently being utilized in the National Standard Reference Data System and what the plans are for the future?

At present computers are being used in the NSRDS in the operations of certain individual data centers for the storage, retrieval, and analysis of data of special interest to those centers. Plans for the future include the following considerations:

(a) The development of communicating networks of data centers in which a computer based storage system at one location could be directly interrogated by a scientist at another center or by the computer system or another center to obtain data, references, or interpretive programs of common interest;

(b) An information services operation of the National Standard Reference Data System based on a substantially automated data file which will be used for the storage and retrieval of all the critically evaluated data products of the system. This data file which will be used as the source of information for the various custom services which have been discussed previously before this committee. The entire content of this data file may not be located in any single computer or computer storage adjunct; however if portions of the file are stored in different locations, intercommunication among the computer components would be established for immediate access to the whole file;

(c) As our knowledge of the physical universe increases, it becomes more and more possible to calculate certain physical properties (especially of very pure materials) from a knowledge of basic physical laws and a few fundamental properties. Computer systems will be fully utilized to permit such calculations whenever the reliability of results is equal to that of the measured properties;

(d) In certain cases experimental measurements of physical properties can be performed at widely spaced intervals of temperature, pressure, and other variables, and well-known mathematical expressions can be employed with the extrapolation or interpretation of values. Computer storage of the skeleton tables and the interpolating or extrapolating rules and formulas will be the most efficient way to store some standard reference data.

(a) When do you expect the National Standard Reference Data System to become substantially a computerized system?

All of the above identified computerized portions of the National Standard Reference Data System are presently being studied or evaluated. In current NBS planning, full utilization of computers in most of these specific modes is two to five years away. Systemization of a complete computerized data file is the most difficult part of this system to plan for exactly at the present time. However, NBS computer scientists have estimated that all of the necessary computer components are either now in existence or will be fully developed by the time we are ready to utilize them. A computerized data file is probably at least five years away, and this minimum figure would be dependent upon rapid development of the critical evaluation programs to provide the data input to such a file.

ADDITIONAL QUESTIONS SUBMITTED FOR THE RECORD TO DR. ALLEN V. ASTIN, DIRECTOR, NATIONAL BUREAU OF STANDARDS, DEPARTMENT OF COMMERCE, BY REPRESENTATIVE JOE D. WAGGONER, JR.

1. How is it possible for the National Bureau of Standards to undertake the functions envisioned in this bill without significantly increasing the amount of research it performs in-house?

While some increase will be necessary in the number of people at the National Bureau of Standards who will be doing compilation work, as indicated by Dr. Hollomon in his answer to your question No. 7, no overall increase of any consequence in the amount of experimental research is anticipated. This is because the NSRDS program is concerned primarily with the compilation and evaluation of data that have been or are being produced by existing research projects in NBS and, most particularly, in other institutions. It is expected, of course, that the results of the evaluations and compilations will constitute an important source of guidance to the research program of NBS.

(a) Will it not be necessary for the Bureau to duplicate some of the experiments in-house in order to at least spot check the accuracy of the various assigned values?

Some spot checking of the various assigned values will be necessary. The Bureau will perform such checking only in those areas where it already has a high level of technical competence, and thus little additional research effort or research equipment will be needed for this purpose. In other technical areas, the spot checking will be done at other locations by the people who are doing the compilation. This is one of the reasons why we feel that compilation work should be performed by those who are expert in the field, and are actively working in it.

(b) After this program becomes fully operational, what percentage of the \$20 million estimated annual cost do you expect to be performed in-house and what percentage do you expect to be performed out-of-house?

Table II attached to Dr. Hollomon's answers shows that on a dollar basis, three-quarters of the compilation work will be performed out-of-house and only one-quarter in-house. Providing the information services described on page four of my statement will be a major in-house effort and will require about 10% of the total estimated annual cost. Of the total program costs, approximately 40% will be spent for in-house activities and 60% for out-of-house.

2. On page 4 of your prepared statement you say that "this storehouse will eventually contain a complete collection of compilations of critically evaluated data produced throughout the world." How many years after the enactment of this bill do you mean by "eventually"?

While it is difficult to predict how long it would take for a comprehensive collection, it will probably take a minimum of three to four years to obtain substantial results with the exercise of proper precautions for high quality and careful coordination of the various projects. There will be some lag (averaging one to two years) between the time a project is started and the time its output is ready to be entered into the storehouse.

3. On page 7 of your prepared statement you say that "hundreds of millions of dollars will be unnecessarily spent in the achievement of those goals unless NSRDS is effectively implemented."

(a) Can you be more specific as to what you mean by "hundreds of millions," and is this an overall or an annual savings?

(b) How did you arrive at that estimate?

We estimate that savings of at least \$100 to \$200 million per year would result, and the figure may be considerably higher though this is difficult to estimate quantitatively. The figures quoted are based on the following analysis:

Each technical man is saved 10-12 minutes per week by having a convenient source of evaluated data more readily available. This adds up to 10 hours per year per man. Taking an average figure of \$10/per hour per person (including overhead), this is a saving of \$100 per technical person per year. For all of the

nation's 1.5 million scientists, engineers and technicians, the calculation gives \$150,000,000 annual economy in *time saved alone*. Substantial additional savings would accrue through avoiding of errors incurred by the use of unevaluated data.

Other approaches to estimating the savings that can be expected were outlined in Dr. Hollomon's initial statement to the Committee on June 29, 1966.

4. *On page 8 of your prepared statement you say that the narrower goals of NSRDS "is probably within the capability of available manpower in the United States." This being the case, where would the Bureau get the manpower for the broader goals which you describe?*

The broader goal described would extend the range of the system to a much wider scope of materials and properties. We would recommend against such expansion in the immediate effort. It may become necessary to consider such expansion eventually, and manpower for the work would come from two sources: (a) growth of the technically trained manpower resources of the U.S. and (b) development of an international program which would utilize competent scientists all over the world.

(Whereupon, at 12:30 p.m., the subcommittee was adjourned to reconvene at 10 a.m., Thursday, June 30, 1966.)

A BILL TO PROVIDE A STANDARD REFERENCE DATA SYSTEM

THURSDAY, JUNE 30, 1966

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT,
Washington, D.C.

The subcommittee met, pursuant to adjournment, at 10:25 a.m., in room 2325, Rayburn House Office Building, Hon. Emilio Q. Daddario (chairman of the subcommittee) presiding.

Mr. DADDARIO. The meeting will come to order.

Our first witness this morning is Dr. Frederick Seitz, President, National Academy of Sciences. Dr. Seitz, we want to welcome you here this morning. We are pleased to have you before us again.

STATEMENT OF DR. FREDERICK SEITZ, PRESIDENT, NATIONAL ACADEMY OF SCIENCES

Dr. SEITZ. Thank you, Mr. Chairman; it is always a pleasure to appear before your committee.

I have a prepared text. However, I will deviate from it at times in view of some of the previous testimony.

The National Academy of Sciences is thoroughly in accord with the objectives of the Standard Reference Data Program at the National Bureau of Standards. We feel strongly that the program should be expanded and strengthened since further advances in science and technology will depend heavily upon the availability of reliable quantitative scientific information, particularly that which can be identified as critical tables of standard reference data.

Certainly the most notable example of an effort to provide critical tables of standard reference data is the International Critical Tables of Numerical Data of Physics, Chemistry, and Technology. Preparation of these tables resulted from discussions begun at the 1919 Conferences of the International Union of Pure and Applied Chemistry at London. The United States was assigned financial and editorial responsibility for the project and the National Academy of Sciences-National Research Council accepted the executive, editorial, and financial responsibilities for the United States.

The entire enterprise was made possible by the cooperation of the American Chemical Society and the American Physical Society, together with essential support from industry, which contributed funds totaling \$200,000. This famous collection of numerical data was the result of cooperative efforts by some 400 scientists in 18 differ-

ent countries. Seven volumes with a total of approximately 3,500 pages were published in the years 1926-30, constituting the largest single compilation of critical data in the history of science up to that time. These volumes provided scientists and engineers with a compact set of authoritative tables giving them the data needed in their research, development, and engineering activities.

The Academy established a Committee on Tables of Constants in the early years of World War II. Although this Committee considered it desirable to have a revision of the International Critical Tables, it saw no ready solution to the problems created by the steady growth in the quantity of such scientific and technical data. In 1955, the Committee concluded that there was no hope of repeating the work of the International Critical Tables as a single compilation. This conclusion resulted from the following considerations:

1. The fields of chemistry, physics, and engineering, as well as other disciplines, had expanded greatly in size and in their requirements for quantitative data of all kinds.

2. Both precision of measurements in science and the precision of manufacturing in industry had been pushed to new levels in the intervening period, requiring more accurate data of even greater precision.

3. Rough estimates indicated that an adequate and complete revision and extension of the International Critical Tables would be 100 to 200 times as great as the original task.

4. Any new undertaking of this kind should provide for continuity.

5. By 1955 a number of large data-compiling projects operating on a continuing basis had come into existence in the United States, involving total annual expenditures of about a million dollars.

Recognizing the need for central planning, the National Academy of Sciences-National Research Council created in 1957 the Office of Critical Tables with the following responsibilities:

- (1) The coordination of existing compilation projects;

- (2) The stimulation of new projects;

- (3) The establishment of a directory and index service for projects;

- (4) The encouragement of uniform editorial practices and other items that go into the expression of quantitative data (e.g., use of approved nomenclature, symbols, units, fundamental constants, the adoption of suitable publication forms for compilation of numerical data, et cetera); and

- (5) The establishment of communications in this area, to the extent practicable, with scientists in other countries.

The formation of this Office by the Academy was greeted with enthusiasm and hope by the scientific community. It succeeded in making progress with most of its aims. But, in the all-important task (item (2) above) of encouraging the creation of new centers for the evaluation, consolidation, and compilation of standard reference data, it failed because no agency, government or private, was able at that time to provide the necessary funding. The establishment in 1963 of the National Standard Reference Data Program at the National Bureau of Standards, with the full backing of the Academy, marked the beginning of a strong central coordination and management center which, hopefully, would receive adequate funding.

The evaluation of data is an international problem. The leadership of the United States is, by its example, encouraging other countries to assume a part of the scientific and financial burden for data collection, evaluation, and compilation. The Academy, with the cooperation of scientific organizations in 5 other major countries and of 10 international unions adhering to the International Council of Scientific Unions, has recently created an International Coordinating Committee for Data in Science and Technology. This Committee will stimulate programs in other countries which will both complement and supplement reference data activities in the United States.

The President of the Committee is Frederick D. Rossini of the University of Notre Dame who is also Chairman of the Executive Committee of the Office of Critical Tables of the Academy which as one of its functions supplies advisory services to the Standard Reference Data Program. Dr. Rossini spent many years at the National Bureau of Standards in the early part of his career and is well known to the Bureau.

The United States must continue to be active in this area of international cooperation and must bear its share of the costs for the international committee and its supporting staff.

Now, turning to the bill before us, I can state that the Academy and the scientific and technical community it represents are in full agreement with the overall purposes of the bill. We are delighted with this evidence of an effort on the part of the Government to strengthen the Standard Reference Data Program.

The cooperative nature of the program must be emphasized. Many of the data to be evaluated are produced in nongovernmental research laboratories, both university and industrial, in the United States and abroad. These data are to a large degree published first in journals of the scientific societies which are almost without exception privately controlled, although they operate on a not-for-fee basis. In part they become the subject matter of many handbooks and data compilations in the United States and in other countries. Many important data are produced by private industry in the course of new product and engineering development and enter the regular channels of science and technology. In view of these facts we wish to express some concern about the wording of sections 7(a) and 7(b) of the bill. Section 7(b) appears to place a copyright on products of the Standard Reference Data Program, whatever their origin, contrary to the usual practice with governmental publications. This restriction could, if not watched, serve as a deterrent to a free flow of scientific data. We should like to point out also that copyright problems are under review at this time in both the executive and legislative branches of the Government.

Mr. DADDARIO. What is your recommendation as to this section? Should it be eliminated or would you suggest other terminology?

Dr. SEITZ. I would say the following: I am in general accord with the concept that the Bureau of Standards should receive some fair remuneration for the sale of some of its work. This, in addition to reimbursing the Government, at least in part, would make it possible for the Bureau to keep up the program, to provide special services, and to make sure that the compilation remains current.

I can think of the following example: Someone may write to the Reference Data Center, asking for special information. This would cost effort and time. If the Bureau had a fund which it derived from the sale, it could then use that money to help provide services, as it is doing in other areas at the present time.

I want to emphasize that I am not opposed to some reasonable compensation for the volumes. I would mean people would take them seriously, among other things. I am concerned about the problem of copyrights and also I am concerned about the possibility of charges being so great that individuals or organizations might be prevented from having the volumes.

MR. WAGGONER. Doctor, isn't the question there whether the Bureau of Standards has the constitutional right to usurp what might already be an existing copyright?

DR. SEITZ. I don't know. I would not pretend to be an expert on the matter of copywriting though I have published a number of books.

MR. DADDARIO. Are you concerned that this section does involve the National Bureau of Standards in a copyright situation, and that this is complicated by the fact that it is under review by other committees of the Congress?

DR. SEITZ. Yes, sir.

I would hope that any implementation of section 5 as it now reads would not result in pricing some standard reference data publications out of the reach of many of our younger scientists and engineers.

Section 6 also gives us concern, for two reasons:

First, the Government, by adopting and using a mark or symbol of approval may be exposing itself to serious criticism in exceptional cases when erroneous or inaccurate data find their way into the standard reference data collections. This can always happen.

Second, in our opinion the appearance of giving authority to numerical data by a mark or seal of approval may not be acceptable to many of our able and productive scientists and engineers. Scientific data by its nature is subject to constant improvement as the skills and techniques of scientists steadily increase. Debate about the correctness of data is a continuing process. Nothing should occur to freeze or impede this discussion.

I may summarize by saying that I strongly support the overall purpose of the bill.

I think that the scientific community would unanimously agree with that statement. I want to point out, however, that sections 5, 6, and 7 introduce questions which should be considered with some care.

Thank you very much.

MR. DADDARIO. Thank you, Dr. Seitz.

Could you discuss the symbol as proposed in section 6 in a little greater detail? I ask you to do so because this has been a matter of concern to the committee. The possibility that the symbol would place any responsibility on the Government at all for accuracy is not likely since it is generally recognized that these figures should be taken for what they mean under the present circumstances. You do in a sense back up the concern the committee has shown. I do think your concept ought to be expanded a bit.

Dr. SEITZ. I have the feeling that if the compilation is as good as I suspect it will be, the mere fact that it comes from these volumes will be adequate. It would not be necessary to have another separate symbol associated with it.

Many, many scientists and engineers, in using the data in the International Critical Tables, which I mentioned earlier would, in a footnote, just say that they obtained the values from the International Critical Tables. The quality of the work was sufficiently well known that nothing else was needed to give the reader a notion of the general standard that was implied. I think that would be adequate.

Mr. DADDARIO. Unless the work is developed in such a way as to change the degree of quality necessary in the scientific community. Except for that, the symbol would neither add nor detract?

Dr. SEITZ. Exactly.

Mr. DADDARIO. The development of a way to make appropriate payments to the Commerce Department also has troubled us. You raised the point that younger scientists and engineers may be barred from obtaining this information when they need it. Would you give us further ideas on this? This question has been answered previously in this way. The value of the information would be shown if people were ready to pay for it.

Dr. SEITZ. Yes, I think some charge is completely reasonable. It means that people will not ask for the compilations unless they have a serious interest.

On the other hand, I think one serves the community by making the material available at what I call a reasonable fee, regarding it as a catalyst for international and national science.

Mr. DADDARIO. Mr. Mosher?

Mr. MOSHER. Dr. Seitz, as I understand your position, speaking for the scientific community, you are saying that this is an undertaking that needs to be done.

Dr. SEITZ. It is long overdue.

Mr. MOSHER. This need is not likely to be met by any other group or combination of groups other than the Government, is that right? This is a case where almost of necessity the Government has to take the initiative.

Dr. SEITZ. I think this is the best way and I think it is also important that it be initiated by a large technologically oriented nation such as ours.

Mr. MOSHER. However, the assistance we will get from scientists around the world will be significant.

Dr. SEITZ. Very significant. There is much enthusiasm for the program.

Mr. MOSHER. The quality of that work will be significant, too.

Dr. SEITZ. Yes, sir.

Mr. MOSHER. You are saying that the National Academy of Sciences is not prepared to do this, or any other non-Government agency that you know of? The Government will not be stepping on someone else's toes?

Dr. SEITZ. I think not. The Academy prefers to retain an advisory role when it can. We do occasionally enter into operations, but I think this project would be ideally handled by the National Bureau of Standards.

Mr. MOSHER. The American Association for the Advancement of Science would not be able to take it on?

Dr. SEITZ. I do not believe so. If there were no other way of doing it, the National Academy of Sciences—National Research Council could. On the other hand, I think it is better to have the National Bureau of Standards undertake this.

Mr. MOSHER. You say if the Government doesn't do it, you could? Is that right? That is an interesting statement.

Dr. SEITZ. I will put it this way: We played a key role with regard to the original compilation and if no Government agency were prepared to do it, I think we would give serious consideration to undertaking it.

On the other hand, I think that since the National Bureau of Standards has the interest, and the competence, it is best if it is done as proposed in this bill.

Mr. MOSHER. And you think that view you have just expressed would be almost universal throughout the scientific community?

Dr. SEITZ. I think so.

Mr. MOSHER. You don't think that view would be challenged?

Dr. SEITZ. I don't think it would be seriously challenged by those who have given responsible thought to it.

Mr. MOSHER. I have nothing further.

Mr. DADDARIO. Mr. Vivian.

Mr. VIVIAN. With reference to the cost of preparing this compilation, I am sure that very few useful compilations can be prepared except for minor abstrating for less than several thousands of dollars, as an absolute minimum, and it would be more likely 10 times that amount.

Dr. SEITZ. Yes.

Mr. VIVIAN. If you had to charge a cost per volume, how would you anticipate spreading this cost? Are you thinking in terms of, say, charging \$1,000 to the first 10 users, or \$10 to the first 1,000 users? How would you conceive of the cost being recouped? How would you do it if the scientists had to go ahead with it?

Dr. SEITZ. Working out the details is not a trivial thing and I don't want to speak irresponsibly. I think some reasonable charge can be made per volume. I don't see very easily how you could shift the price as you go along.

Mr. VIVIAN. Testimony yesterday by Dr. Hollomon discussed this same area. He raised the question of perhaps some particular firm being interested in a compilation on some particular material or some class of materials. The question is: How much do you charge for the second volume? The orders come in a month apart. The volume already exists and is on the shelves and has been paid for at some fairly high price. I would assume it would cost at least thousands of dollars. The second firm comes along and asks for a copy. What price do you place on the second copy?

Dr. SEITZ. If the first organization wanted special service, then perhaps one would have a separate fee for that special service. Once the compilation was available, presumably one would put a standard price on it.

Mr. VIVIAN. What kind of a price?

Dr. SEITZ. I would think that would have to be worked out from case to case.

Mr. VIVIAN. For example, there could be a reproduction price, or a publication price with some significant amount of overhead added.

Dr. SEITZ. As I recall, the Bureau of Standards at present does charge a fee for its standards. If a company writes in and wants certain standards, it charges a fee. I don't know whether they attempt to recoup all of the expenses of preparing the standard, but they try to recoup some and this gives them a fund whereby they can then be in a better position to render service to other organizations which ask.

I would think some rational scheme—and I am not prepared to invent it in detail here—could be set up to allow the rendering of a service and yet not expect to receive compensation for every cent it spends in rendering the service.

In the last analysis, one expects the Bureau of Standards to render public service.

Mr. VIVIAN. At the present time the Bureau of Standards desires to be excluded from the provisions which require publication in the Government Printing Office, which charges something like 150 percent of the cost of printing documents. Do you see any reason to dispute their desire of not being required to use the Government Printing Office?

Dr. SEITZ. I wouldn't like to see the charges get too large. I would have to see what the charges were in individual cases to see whether they are reasonable or not.

Mr. VIVIAN. Would you consider charges of \$1,000 a compilation a reasonable charge?

Dr. SEITZ. Under certain circumstances, that would be completely reasonable. If there is a special need.

Mr. VIVIAN. Would it be fair to continue a charge of \$1,000 per compilation over many users?

Dr. SEITZ. You mean charging each one a thousand dollars?

Mr. VIVIAN. Yes.

Dr. SEITZ. I think you would have to consider it in terms of the work that went into the given compilation and what its uses were. If there was some highly specialized industrial use, then that might be completely reasonable. If it was a set of properties of the elements for educational purposes, I think it might be unreasonable.

Mr. VIVIAN. The reason I pick that number is that I think it is less than the true cost of any reasonable compilation. It is a high cost compared to reproduction costs of a volume. I can imagine after a hundred copies are published, it would be impossible to charge the original cost and it would seem rather difficult to charge more than reproduction cost, unless there was some banking scheme by which funds were returned to the original requester. This is not an easy question to handle.

Dr. SEITZ. And in fixing the price, one always tries to guess what the ultimate market will be and how many users there are.

Mr. VIVIAN. I asked this question of Dr. Hollomon yesterday and he indicated they did not desire to do a market study before each effort.

Dr. SEITZ. I think someone's intuition will have to enter into the pricing.

Mr. DADDARIO. There must be some such thought developed to put the information together in the first instance. Otherwise, it would not fall within that critical area of a goal to be achieved, would it?

Dr. SEITZ. Yes. Although there are many compilations of data which are necessary, not because there is an enormous volume of use, but because they are an essential link.

Mr. DADDARIO. Even in those instances, you would determine who would need it and what the value of it would be.

Dr. SEITZ. That is right.

Mr. DADDARIO. You would come to some judgment of this question which Mr. Vivian raises as to the potential cost return.

Dr. SEITZ. Yes. Occasionally there might be surprises, as there are in any such effort.

Mr. DADDARIO. If there are surprises, then some workable arrangement would have to be worked out to meet this problem of how not to overcharge the first users and what to charge those who came in after the costs had been set. I think Mr. Vivian raises a good point. I would expect anyone who published a compilation, in or out of Government, would have to come to some similar determination.

Dr. SEITZ. Commercial publishers are doing it all the time.

Mr. VIVIAN. May I inquire of Dr. Seitz what firms are now active in the commercial market which can provide this type of service? Suppose an industrial client wished to obtain such service. Does he have to go to the National Bureau of Standards?

Dr. SEITZ. I think on the very broad front there is no commercial organization that would cover the scope of this. There are commercial firms which would give advice in many, many areas, connected, perhaps, with radioactive materials on the one hand, or special metals for various purposes.

There are also organizations, such as the American Society for Testing Materials, which will provide information to industry.

Mr. VIVIAN. Does ASTM make a charge for such information?

Dr. SEITZ. I don't know. They certainly publish many things which they sell, as any society does. Whether one pays an extra fee for special advice, I don't know.

Mr. VIVIAN. Mr. Chairman, I would appreciate it if we could have the committee staff look into the question of how these charges are set.

Mr. DADDARIO. That will be done, Mr. Vivian. Have you further questions?

Mr. VIVIAN. No further questions.

Mr. DADDARIO. Dr. Seitz, thank you very much. We appreciate your coming.

Our next witnesses are Mr. Curtis G. Benjamin, chairman of the board, McGraw-Hill Book Co., Inc., and Mr. W. Bradford Wiley, president, John Wiley & Sons, Publishers.

Gentlemen, I understand you will be appearing together, although Mr. Benjamin will make the formal statement.

**STATEMENT OF CURTIS G. BENJAMIN, CHAIRMAN OF THE BOARD,
MCGRAW-HILL BOOK CO., INC., AND W. BRADFORD WILEY,
PRESIDENT, JOHN WILEY & SONS, PUBLISHERS**

Mr. BENJAMIN. Mr. Chairman, we are delighted to appear before this committee. I might say members of the technical publishing industry have covered the diligent work of your subcommittee with a great deal of admiration and we are delighted to be here today.

Mr. Wiley and I represent the main two organizations for book publishing. I am representing the American Book Publishers Council and Mr. Wiley is representing the American Textbook Publishers Institute, and these two organizations together have memberships which represent about 95 percent of the commercially published books in the country.

We also represent a special group in the American Book Publishers Council. This is the technical, scientific and medical publishers group who have naturally a special interest in this legislation.

Now, before I get into my statement, I would like to say Mr. Wiley and I have had the privilege of conferring with Dr. Astin of the Bureau of Standards and with a member of Dr. Hollomon's legal staff, Mr. Christianson. A number of questions were clarified to our satisfaction and as a result of this conference we understand that the department will propose some changes and amendments in the bill as it now stands.

With your permission, I would like to start on page 2 now and read my formal statement with a few marginal comments.

I would like to begin by saying that we support the general purpose of the bill. It is appropriate for the Federal Government to sponsor and finance gathering, evaluation and editing of basic data in accordance with agreed national standards. We are also in accord with the general philosophy of the bill that those who make use of these special services for standard reference data should in some way contribute to the cost of disseminating this information.

I would say this should be a substantial contribution rather than a token contribution.

Although we support the general purposes of the bill, it seems to us that some of the specific provisions designed to carry out these purposes are open to question and should be examined further. Thus, the bulk of the rest of our statement will consist of raising questions which we believe the committee and the sponsors of the bill should carefully consider before placing any such program into operation. This was clarified in our conference last night and I think it was clarified somewhat in the testimony yesterday, so this misgiving is certainly on the way to being solved to our satisfaction.

Mr. DADDARIO. Well, I am pleased to hear that, Mr. Benjamin, because during the course of the testimony it seemed to me there was some definite indication as to private participation and dissemination of the material. What the process to bring it about would be was not clear, which gave us concern here in the committee. You have recognized, I think, that this was the case. I am pleased that you have had this discussion. We will also, as a committee, look at this matter very carefully. I have indicated time and time again that we are not bound to the language of this bill.

Mr. BENJAMIN. Yes. Mr. Wiley will have a little more to say to this point specifically.

Mr. WAGGONNER. Mr. Chairman, I don't believe the testimony of yesterday does any more than show that it would be possible to contract with private industry. It doesn't state any real intention of so doing.

Mr. DADDARIO. If you will recall, Mr. Waggonner, during the first day of testimony Dr. Hornig made some remarks about the participation by private publishers in the dissemination of the information.

Mr. BENJAMIN. I was not able to attend the hearings yesterday, but we were assured last night that it was the intention of the Department of Commerce to bring in the private sector as much as possible in this, and we think it is possible to bring it in quite heavily.

Mr. DADDARIO. In any case, this matter which concerns you also has bothered the committee. It is something which we will direct our attention to as we discuss the bill and its terminology, in view of the testimony we have received.

Mr. BENJAMIN. We are delighted with this, Mr. Chairman, because we think not only does this prevent freezeouts that Mr. Wiley will talk about later, but also I think it would assure wider dissemination of this material, particularly abroad. Mr. Wiley will talk about that a little later. Now I would like to turn to page 3.

My second question concerns the use of the symbol or mark as provided in section 6. It raises several questions in my mind:

(a) Is it a guarantee of accuracy or authority? If so, what is the Government's responsibility and liability for the dissemination of inaccurate material?

(b) Is it a trademark? If so, is the use of a Federal trade mark legal?

(c) Does it establish a precedent for the U.S. Government "seal of approval"? If so, what implications are there with respect to other kinds and bodies of scientific information generated by or for the Government? If this is "grade A" information, is all other Government information "grade B" or ungraded?

(d) How will it psychologically affect the ranking of nonapproved data of similar or competing nature issued by private professional groups or industrial firms?

(e) Has the Bureau of Standards the best of critical evaluators in all areas of science covered by the data? In actual practice, will it not be necessary for much of the evaluation to be done for the Bureau by persons or organizations in the private sector?

While we sympathize with the implied purpose of the use of a symbol or mark, we seriously question whether it is proper for the Government to put what is in effect an official imprimatur on any kind of scientific data. Further, we question whether the use of such an imprimatur is really necessary.

This question, I must say, still remains in our mind. Hearing testimony and what I have heard about yesterday's testimony, and what Dr. Seitz said this morning, it seems to me this symbol resolves itself into a trademark. I thoroughly agree with Dr. Seitz that this is not necessary. I feel that the publication of this critical data under the auspices of the Bureau will be very well known in the scientific community, and I just do not agree that this will add or detract in the least from it. The other misgiving I have here is that this opens up the Government, and particularly the Bureau of Standards, to requests and probably valid requests for the validation of all other kinds of scientific and technical data, both from Government sources and from non-Government sources. It seems to me if the Government is ready to put its stamp of approval on any one body of data, it has an obligation to evaluate other bodies of data and put the same stamp of approval on it. I would strongly urge that this symbol not be used,

first, because I do not think it is necessary and, second, because I think it would establish some embarrassing precedents, to say the least.

Mr. DADDARIO. Dr. Seitz this morning said that when the International Critical Tables were used, it was enough to reference the information. Because the tables were of such high quality, no symbol or trademark was necessary.

Mr. BENJAMIN. I think any user of this data, anyone who is competent to use the data, will know the source of the data and its background. If not, all he would have to do is to turn to the title page of the volume or print-out or the operator of the system to know its origin and to know its dependability.

Mr. DADDARIO. In the final analysis, that is the important point.

Mr. BENJAMIN. That is the very important criteria. If it comes from the U.S. Bureau of Standards, it ought to be pure, or as pure as we can make it.

I agree with Dr. Seitz' point of view on this completely.

Third, it is clear that sections 6 and 7 are intended to change existing law which prevents the copyrighting of official Government publications. We assume that this was the direct intention of the sponsors of the bill. While we can sympathize with the desire to protect the integrity of the data, we suggest that a circumvention of present law in this instance would invite many proposals and applications for similar circumventions in the in-house production of other kinds of scientific and technical information generated by Government departments and agencies. While the proposed system of Standard Reference Data will compete with only a few private publications, it is conceivable that this exemption from copyright would open the door to in-house production of similar systems of Government scientific and technical information that would widely and directly compete with publications in the private sector.

While sections 7, 8, and 9 would effectively control copying in the United States, there would be absolutely no control over copying in foreign countries. This would, of course, be objectionable to many taxpayers. In addition, unlike copyright, which is limited to a term of years, the protection in the bill seemingly is perpetual.

I feel here it would be unfair for the U.S. Government to place any restrictions on domestic use of materials that could be used freely in foreign countries. I will have a little more to say about this in another connection later.

On the other hand, the present bill seems to afford no protection against the use of data in mechanized information centers. It would be most unwise to allow operators of computerized systems to use the data freely while denying others the same privilege.

Finally, we venture to suggest that the production of a federally supported Standard Reference Data System by the National Academy of Sciences would be much more palatable to private publishing industry than would in-house production by the Bureau of Standards. Further, the Academy, as a contracting agency, could copyright the data and thus this highly controversial problem would be resolved.

We hope that this explanation of our views may be helpful to the subcommittee and we stand ready to cooperate further in any way which the subcommittee may desire.

If I may, I should like to go into a little more detail on the essentiality of copyright protection. I feel insofar as possible that this material, or as much of this material as possible, should be protected by copyright, and for three reasons. First, to protect the interests of the private sector, and the foreign contributors, to protect their rights in this data. I would guess, and this is a guess, from what I have heard that perhaps as much as 70 to 75 percent of the input into this system will come from the private sector or from foreign sources. It would seem to me very unfortunate, if having this input evaluated by the Bureau in this system would result in placing it in the public domain and therefore depriving the private interests and the foreign interests of protection of the input of the data.

It might indeed in some cases prevent data from being put into the system. Second, I think this copyright protection is absolutely necessary to allow for the commercial publication that has been talked about in these hearings. In the publication, particularly, of the printed handbook volumes of this, I would say that more than 50 percent of the sale of these volumes would be abroad. The foreign export market for this kind of material is absolutely essential to make publications like this commercially viable. The present bill would not give you protection from ensuing foreign sales competition on the same material. In other words, a commercial publisher who contracted to publish this could sell it only in the United States. Then he would have a most difficult problem of controlling what we call sell-around from people who print the material outside of the United States and ship it into the United States for sale. So I think international copyright is an absolute essential if you are going to have commercial publication and everyone says we want to have commercial publication, and we should have commercial publication.

Thirdly, I think the copyright is necessary for the protection of the use of the material in computer systems. It would be most unfair, I think, to allow any situation, as the present bill would allow, which would permit the operators of a large computer system to use it, but would not allow the smaller user who wanted to print it or photocopy it or something like that not to use it. The only way that I see to get protection would be to copyright the material and to follow, in the language of the bill, the recommendation of the Copyright Office that the input of this material into a computer system is indeed making a copy, and therefore the material is protected against such input without permission from the copyright owner.

I think revision of the bill before you is necessary to accomplish all three of these ends and to allow the Bureau of Standards or a prime contractor to subcontract the private production of these materials under copyrighted form. I suggest, of course, that the revisions and changes here should be drafted in consultation with the Copyright Office, not only to be sure that they are in conformity with the demands of the present law but that they might not be shot out from under in the revision of the copyright law, which is now, as you know, before the House. If I may, sir, I would like to suggest that Mr. Wiley talk about the economics of this and some of the things that were talked about in terms of how it might be done commercially in pricing et cetera.

Mr. DADDARIO. Mr. Wiley, will you proceed?

Mr. WILEY. Thank you, Mr. Chairman. Perhaps you and the members of your committee might ask questions of Mr. Benjamin before I move into a different area which perhaps would lead them away from their questions.

Mr. BENJAMIN. I usually disagree with Mr. Wiley and I am going to now. I think he should give his testimony.

Mr. DADDARIO. I am not necessarily going to disagree but I do think if you proceed, the subcommittee will get an impression of your joint opinion. Then we can ask questions.

Mr. WILEY. Thank you, sir. This will be even briefer than I intended because Dr. Seitz talked about some things in his testimony that I had intended to include in my statement.

He referred specifically to the historic example of the International Critical Tables published so successfully as an important contribution. He noted, perhaps, not as fully as I intended to, that funds were found in the National Research Council on behalf of the National Academy of Sciences, which undertook to negotiate a contract. Those volumes are still in demand, despite their apparent historic age. It is important to note that private funds underwrote the editorial compilation, private funds were used for the production and distribution, and that royalties have come back over the years to the National Academy.

For many years the scientific and technical book publishers have been very much concerned over what we look upon as unfair Government competition. This is a concern that we have pursued with some degrees of success but not to our satisfaction. It arises now in a much more complex and complete way because, as you gentlemen know, a very large part of the scientific and technical research being undertaken in this country is being funded with Federal funds. The percentage is astronomical. We believe that scientific and technical information which results from those efforts, insofar as this becomes publishable material, should be printed, published, and distributed in the private sector. This we believe is necessary in order to prevent what might become a Government monopoly of scientific and technical information. It is also important, from our point of view, that such information, if publishable in book form, be in the private sector in order to maximize distribution. The Superintendent of Documents, the publishing arm of the Government Printing Office, is in no position to do this, either in the domestic market or, more importantly, in the worldwide market.

The private sector procedure would then lead to some recovery of costs. This question has been raised by a member of the committee, how much of the recovery could come out in the form of royalties paid by a private publisher. It is difficult to estimate, but I think it is important to note that it would only be a small part of what might be identified as the cost of developing the information. Publishing in the private sector, as I said, will result from our point of view in saving the Government production, printing and distribution costs which otherwise would have to be funded with Federal moneys.

In referring to the Standard Reference Data Program, I do not disagree with Dr. Seitz, except I want to clarify one matter and that is that we as commercial publishers are under no illusion that all of this

information will eventually and can eventually be published in book form. Selected parts of it will certainly have use in book form. So that this comes back to the question of marketing, the market analysis which a publisher would of necessity have to make before he would seek a license in order to use that material. I think it would be unrealistic to expect our Bureau of Standards to engage in a marketing analysis effort. This would take them too far from their important mission. When it comes to the pricing of these publications, it is interesting to note that the American Chemical Society's most important publication, commonly called Chemical Abstracts, used to be available at a very modest price. The current subscription is \$1,250 a year. There is a good reason for this, because there is not a very large market for that particular publication in the sense that if you reduced the price, you could increase your market very rapidly.

The purchasers of that information are industrial organizations, institutions of all kinds, specialized purchasers scattered throughout the world. They very much appreciate the value of the information and are quite prepared to pay a price that no individual purchaser for obvious reasons would even think about paying. I think this may well be the case with some of the data when it appears in book form. Speaking personally in connection with our firm, we might seek out certain information which could be obtained under a royalty (copyright) license in print-out form from one of these monster computers that are all around us today. But we would also know that perhaps as few as 2,000 people might buy that information and those 2,000 purchasers could be scattered throughout the globe. At \$5 you still would not sell more than a few individual readers copies of this material. But at a price of \$100 which might be the required price, all of those who really need it would be perfectly willing and more than happy to pay.

As Mr. Benjamin mentioned, U.S. scientific information in book form, an area with which he and I are familiar, is very much in demand throughout the world. In the case of many books that we publish under our various imprints the first 2 years sale can be 60 to 70 percent export. Our friends abroad are hungrier, it would appear, than some of our domestic friends. I, too, feel that if a sponsor is needed—I know Dr. Seitz is not too happy with this prospect—use of the National Academy of Sciences and Engineering should be made.

To turn to a more general area of scientific and technical communication, and this is to me an incomprehensible problem, much work is being done. You are familiar with the work done by the COSATI committee. I am not certain that you gentlemen may be aware of the fact that the National Academy has, with funds provided by the National Science Foundation, recently established a new Committee on Scientific and Technical Communication. I have here a copy of the statement which was made to the public at the time of the establishment of the committee. It deals with many of the problems that we are talking about today, but it also is important to note that the interactions and interrelations of the Federal Government and the private sector are a major concern of this committee. This is a committee which is going to devote a great deal of time over a period of 3 years on a comprehensive study of the problem. I point to this as

merely an example of the complexity of scientific data and information and its proper distribution. I think that is about all I shall say.

Thank you, sir.

(The release follows:)

[News release from National Academy of Sciences-National Research Council]

TWO ACADEMIES ESTABLISH COMMITTEE ON SCIENTIFIC AND TECHNICAL COMMUNICATION

WASHINGTON.—The National Academy of Sciences and the National Academy of Engineering have jointly established a Committee on Scientific and Technical Communication, at the request of the National Science Foundation, it was announced today.

The committee will provide a focus for participation by scientists and engineers through their societies in the consideration of plans for a national network of information systems in science and technology, as proposed by the Committee on Scientific and Technical Information (COSATI) of the Federal Council for Science and Technology.

In its study of the present status and future requirements of the national scientific and engineering communities with respect to the flow and transfer of scientific and technical information, the committee expects to work closely with COSATI, the Office of Science Information Service of the National Science Foundation, the Office of Science and Technology in the Executive Office of the President, and with the professional groups that perform information services.

Chairman of the committee of 14 leaders in academic and industrial research and technology is Dr. Robert W. Cairns, Director of Research of the Hercules Powder Company, Wilmington, Delaware.

Dr. Cairns, a former Deputy Assistant Secretary of Defense (Research and Development) and Past Chairman of the Division of Chemistry and Chemical Technology of the National Research Council, is presently a Director of the American Chemical Society.

The Committee of Scientific and Technical Communication will give special attention to information activities and policies of groups and organizations in the private sector, both at home and abroad, and to the interactions and interrelations of the Federal Government and the private sector, especially Federal actions or operations that affect substantial portions of the private sector.

Of particular concern will be:

1. Methods for promoting more effective relationships between information systems and the principal producers and users of scientific and technical information.
2. Techniques and systems for improving information transfer.
3. New means of providing greater selectivity and consolidation in information transfer.

The committee will make recommendations both to private organizations and to Federal agencies on courses of action required to maintain effective communication within and among fields of science and technology, even as the professional literature in these fields rapidly expands.

The total volume of scientific and technical information, and the demands on existing information systems, have grown at an explosive rate during the post-war period as a consequence of the overall expansion of the nation's research and development activity—to an estimated level of \$23 billion during the current year.

DR. WEYL TO HEAD STAFF

In announcing the formation of the Committee on Scientific and Technical Communication, Dr. Frederick Seitz, President of the National Academy of Sciences, also announced the appointment of Dr. F. Joachim Weyl to the executive staff of the Academy as a Special Assistant to the President, effective April 1.

Dr. Weyl, who has resigned his position as Chief Scientist of the Office of Naval Research, Department of the Navy, will serve in one of his first assignments as Executive Secretary of the committee.

With the Office of Naval Research since 1947, Dr. Weyl has been head of its mathematics branch, scientific liaison officer in London, director of the mathematical sciences division, and research director, before becoming Chief Scientist

and Deputy Chief of Naval Research in 1961. Dr. Weyl, 51, was born in Switzerland. He received his B.A. degree in 1935 from Swarthmore College, and his M.A. and Ph. D. from Princeton University, in 1937 and 1939, respectively.

Members of the Committee on Scientific and Technical Communication are: Robert W. Cairns, *Chairman*; George E. Holbrook, Vice President, E. I. du Pont de Nemours and Company, Inc.; J. C. R. Licklider, Consultant to the Director of Research, International Business Machines Corporation; Clarence H. Linder, Vice President and Group Executive (Retired), General Electric Company; H. W. Magoun, Dean, Graduate Division, and Professor of Physiology, University of California, Los Angeles; Nathan M. Newmark, Head, Department of Civil Engineering, University of Illinois; W. H. Pickering, Director, Jet Propulsion Laboratory; Byron Riegel, Director of Chemical Research, G. D. Searle and Company; William C. Steere, Director, The New York Botanical Garden; John W. Tukey, Professor of Mathematics, Princeton University; Merle A. Tuve, Director, Department of Terrestrial Magnetism, Carnegie Institution of Washington; Paul Weiss, University Professor, Graduate School of Biomedical Sciences, University of Texas; W. B. Wiley, President, John Wiley and Sons, Inc.; and Van Zandt Williams, Director, American Institute of Physics.

The National Academy of Sciences and the National Academy of Engineering are private organizations which cooperate under a single Congressional Act of Incorporation to advise the Federal Government, upon request, in any field of science or technology.

Mr. DADDARIO. Mr. Waggonner.

Mr. WAGGONNER. Mr. Chairman, I had to go to the telephone during Dr. Seitz' statement. Perhaps this is even a better time to raise the question since we have gone into the percentage of these publications that might be sold overseas as related to the volume that might be utilized here at home. Dr. Seitz made the statement that the United States must continue to be active in the area of international cooperation and must bear its share of the cost for the International Committee and its supporting staff. You are in the publishing business. What in your opinion would be the U.S. fair share of cost in this?

Mr. WILEY. That is an area where I am not competent to comment. I think as far as the printed published results in the private sector you can rest assured we charge our export customers just as much as we charge our domestic customers. We do not feel that we can make any distinction. When it comes to the question you raise, sir, I do not feel competent to comment.

Mr. BENJAMIN. I would comment in this way, that when it comes to the published result of our scientific and technical data—particularly the R. & D. effort of the country—I think the foreign customer, indeed the foreign institutions, most of the money for the import into foreign countries of this kind of material comes from Government funds—ought to pay at least the cost of reproducing and disseminating this material.

When I say "reproducing," I mean the printing, binding, selling costs, et cetera. This would vary from one kind of information to another. In this area the cost of compilation and evaluation would run proportionately higher than would the cost of printing, binding, and distributing. I would say that certainly on this kind of thing the United States should recover 50 to 60 percent of any expense of preparing the material from foreign customers.

Mr. WAGGONNER. That just coincides with the figure of possible sales overseas, too, that you expressed.

Mr. BENJAMIN. Yes, it does.

Mr. WAGGONNER. Mr. Benjamin, I would like to comment that the five questions you raised with regard to the use of the symbol or mark are extremely good. They are probably the crux of this entire matter. The committee is certainly going to have to give a reasonable degree of consideration to this area.

I just have one other question and perhaps you cannot make a specific comment on this point. On page 4 of your statement, you refer to sections 7, 8, 9 and said that these sections would provide for no control over copying in foreign countries. Do you know of any way this legislation could be written whereby such control could be provided?

Mr. BENJAMIN. Only through copyright. I do not think there is any other possible way to do it, except by bilateral treaties with some 40 industrial nations. You could pass this legislation and then have a bilateral treaty with 30 or 40 industrial nations, having them accept this.

That would be the only way. But copyright would give you international protection immediately except in the U.S.S.R. and Red China—they being the two big exceptions.

Mr. WAGGONNER. I have no further questions.

Mr. DADDARIO. Mr. Brown.

Mr. BROWN. I have no questions.

Mr. DADDARIO. Mr. Vivian.

Mr. VIVIAN. It seems to me that the question of what the first production or the first tabulation of data should cost is a fairly important one. The funds, which are being considered for the National Bureau of Standards, are already being expended by the National Bureau of Standards in many areas and have produced research reports by the hundreds over a period of time. This information then becomes assimilated into reports on certain topic areas, and these are normally Government reports which are not copyrighted.

Mr. BENJAMIN. If they are done in-house and not done by contract.

Mr. VIVIAN. Yes. Many are done by contract.

Mr. BENJAMIN. Yes.

Mr. VIVIAN. It is also done by the National Science Foundation, the Defense Department and other agencies. So there are many contract reports produced.

Mr. BENJAMIN. Yes.

Mr. VIVIAN. There again the Government does not have a copyright in the report normally.

Mr. BENJAMIN. No.

Mr. VIVIAN. But only in something drawn from it.

Mr. BENJAMIN. Yes, many reports done under contract are copyrighted by the contractor.

Mr. VIVIAN. By the contractor?

Mr. BENJAMIN. Yes.

Mr. VIVIAN. But not normally by the publisher.

Mr. BENJAMIN. Yes, by the publisher.

Mr. VIVIAN. For the contractor?

Mr. BENJAMIN. For the contractor. In some cases the publisher does the copyrighting. In some cases the publisher will take what is commonly called raw data from a government project of some sort

and will put this into publishable manuscript form and publish it and under the terms of the contract may copyright it. We have done this in many cases.

Mr. VIVIAN. I think the question remains, then, that at some point U.S. commercial publishers are free to go over a large volume or large quantities of raw data and decide what type of volume you believe is salable and to then reproduce this material as you see fit, which then produces a copyrightable document on your part.

Mr. BENJAMIN. Yes. But publishers do not usually do this. This is usually done by an author or a group of authors working together who will extract from large bodies a publishable document.

Mr. VIVIAN. Then they contract with you for its publication.

Mr. BENJAMIN. Yes.

Mr. VIVIAN. Nothing which is involved here would prohibit that except for some of the restrictions in sections 5, 6, and 7 of this bill?

Mr. BENJAMIN. That is right. Under the present bill.

Mr. VIVIAN. But those restrictions would inhibit you from any reproduction of this material?

Mr. BENJAMIN. Yes, sir.

Mr. VIVIAN. I think it is impossible to turn over to the National Academy of Sciences the volume of money being considered here for the National Bureau of Standards simply because the National Academy of Sciences does not want a large operational program. On the other hand, it would be possible to turn over to the National Academy of Sciences certain editorial and document preparatory duties under contract which would then put the information back in the same channels as were followed many years ago in the publication of the National Critical Tables. Would that be a wise procedure from your point of view?

Mr. BENJAMIN. I will say this, and this follows Mr. Wiley's statement. With our concern over this whole problem of Government monopoly of scientific and technical information, we technical publishers would prefer to have everything possible done outside of Government agencies. The prospect of in-house programs of scientific and technical information—publishing programs—that would be directly in competition with publishers, gives us nightmares. Mr. Wiley and I have served on the Science Information Council, in San Francisco, and a number of other Government committees, and we know how often this sort of thing is proposed, and it is knocked down usually one way or another.

In general we say from out point of view everything possible should be done out of the Government agency. We would much prefer to see this done in a professional society than in a Government agency, because a professional society obviously has much more flexibility than a Government agency. It has flexibility in arranging publication and distribution, getting royalties, and this sort of thing.

In general, we would much prefer to see this done, the editorial effort, in the Academy. If the Academy does not want to undertake this and thinks it should not, we are in no position to urge it or recommend it. This is just a general position of preference in the private sector of publishing.

Mr. VIVIAN. I think it is nearly impossible to have this done outside of the Government agencies because of the volume of work.

Mr. BENJAMIN. I would agree thoroughly in this case with Dr. Seitz' statement that it is necessary to have this done in the Government or right next door to the Government, in a quasi-governmental agency such as the Smithsonian or the Academy.

There are certainly no private professional societies and certainly there is no one in industry or the publishing business that would have anything like the necessary competence, and naturally they would not get the cooperation of the total scientific community that would be given to this.

It is regrettable, but it is true.

Mr. VIVIAN. Thank you, Mr. Chairman.

Mr. DADDARIO. Mr. Benjamin, your prepared statement indicates your general support for the bill.

Mr. BENJAMIN. Yes.

Mr. DADDARIO. You are concerned about the mechanics.

Mr. BENJAMIN. Yes.

Mr. DADDARIO. And how through it certain trends might develop which would be harmful to the country generally and involve the Government in activities in which it ought not to be involved.

Mr. BENJAMIN. Yes.

Mr. DADDARIO. I have taken the trouble to read an article of yours appearing in the Library Journal of February 15, 1966, which has an intriguing title "Copyright and Government—A Sea of Troublesome Questions."

(The article referred to, together with two other articles of Mr. Benjamin's, entitled "Copyright or Public Domain" and "Computers and Copyrights," are contained in app. B.)

Mr. BENJAMIN. I am flattered, Mr. Chairman.

Mr. DADDARIO. It involves copyright in Government. In it you had one paragraph which I would like to read and would like your comment on it. In that statement you say:

One serious concern involves the large mechanized information systems which the Government will surely spend millions of dollars to develop in the next decade. It now seems probable that federally financed information centers will widely replace conventional information media including several kinds of technical and reference books. One does not have to be especially bright to foresee how this can devastate important areas of commercial printing. This threat is not remote—to many of us it seems to be just around the corner.

I believe, without any question, we are headed in that direction.

Mr. BENJAMIN. Yes, sir.

Mr. DADDARIO. I would like your comment on that.

Mr. BENJAMIN. Yes.

Mr. DADDARIO. And relate it to some of your fears in the matter before us.

Mr. BENJAMIN. We are concerned primarily by what I would call a preemption of basic scientific and technical data. We all know that this started in the basic sciences. We know about the National Chemical Information System that is being established under the American Chemical Society, the chemical abstracts operation, out in Columbus, Ohio. This is a very important development from the national point of view. It will be a basic system in chemical engineering information that will be financed, if present plans are carried through, by the Government. The latest estimate on this is a \$45 million cost. The plan was to finance only the R. & D. phase of this.

But now I understand that there is an informal commitment to see it through the operational stage. This is a complete system of chemical information that will practically preempt this field. As a part of this mechanized system there will be print-outs of all sorts of manuals and handbooks not only of basic data on properties and compounds, et cetera, but also on technology and industrial practice. This will obviously practically wipe out many kinds of handbooks that we have been publishing every year, because this will be completely updated information. You will have a new edition every time you have a print-out. It is something that the commercial publishers cannot possibly compete with. We know that the physicists are planning to come in with a similar system. The biologists are working on a system. The psychologists are working on a system.

The engineering committee of the EJC has been invited and even urged to come in with systems of information in the engineering field. The National Science Foundation is becoming increasingly concerned with the social sciences. We will find mechanized systems of information in the social sciences, even what they now refer to as social engineering, which is air pollution, transportation and these areas. So I sort of foresee the possibility of development of national systems here which could practically preempt all of these areas, and we are concerned that the private sector be kept in this picture.

I might add, when I say the private sector, I would qualify that by saying the "information profit sector" because the concept of these systems is that they will be financed and operated by nonprofit organizations, largely professional societies, which I suppose is necessary. But nevertheless it is not a pleasing prospect to the commercial publisher unless somehow, he, the commercial publisher, can be kept in this picture and be able to contract for the production and distribution of some of this material that is produced with Government funds by the nonprofit societies. This gives us deep concern.

Mr. DADDARIO. Even though you support the general purpose of the bill, you are concerned.

Mr. BENJAMIN. Yes.

Mr. DADDARIO. In the article you also included this language, which I believe to be fundamental insofar as your point of view is concerned:

If the system is to survive, the U.S. taxpayers will have to support indefinitely a project that certainly could and should be self-supporting beyond the initial research and development stage.

Mr. BENJAMIN. That is right.

Mr. DADDARIO. This is something that the committee should keep in mind.

Mr. BENJAMIN. Yes. This grew out of some objection I raised in the National Science Foundation to the Government putting any more than research and development money into this National Chemical System. That is, the National Chemical Information System. It seems to me that the Government should be responsible, since neither the professional society or the private enterprise can get this sort of thing going, for seeing it through the Research and Development stage; having done that and gotten it operational they certainly ought to charge enough to make it self-supporting. First, it should be the test of the marketplace. If this system is as good as it is supposed to be, then the users should pay for it. The people who use this system, the large corporation, the pharmaceutical houses, and many other

users, certainly should pay the price for this after it has got through the Research and Development stage to keep it going. Or else it will be in the Government's lap forever. The other thing here is that as long as the Government subsidizes a good part of the cost of this kind of system information and sells it at an abnormally low price industry is not going to be willing to pay any more for it. The other point here is that there is an inclination in the Government, and there was a little bit of this in the testimony here, to price the service within the range of the least able user to pay for it. There is an inclination to say, the scholar and maybe the libraries cannot afford to pay for this, so we have to price it low. Maybe they will be 5 or 10 percent of the market. What you are doing is subsidizing the 90 percent of the market to get it down to the level of the lower 10 percent of the market. This goes on all the time.

My theory on this is that rather than subsidize firms like General Electric, IBM, McGraw-Hill, et cetera, you should subsidize the low-ability consumer. The scholar should be subsidized so he can pay for it. The library should be subsidized so it can pay for it, and make the others pay the true cost of this. This is indeed going on. We used to put the price low because the libraries could not afford to buy it, but the libraries, with all of the Federal and State support they are getting now, can afford to buy. There are very few—in my experience I would say no more than 5 percent of the purchasers of this Data System we are talking about today—who would be individual purchasers; the rest would be institutional purchasers, libraries, and industry and a good part would be operating under government funds anyway.

Mr. DADDARIO. If we take Dr. Seitz' testimony this morning, he referred to the young students as a least common denominator which we are to look at from the other end as well as from his point of view.

Mr. BENJAMIN. I do not think he is very realistic in this case. I do say if there are a few scholars who cannot afford to do this the Government would much better subsidize those few scholars to allow them to pay for it than to subsidize the rest of the 90 percent of the market which is largely industrial libraries and people who can afford to pay.

Mr. DADDARIO. You had one other item in that same statement which you might feel applies here. You distinguished between publishing and printing.

Mr. BENJAMIN. Yes.

Mr. DADDARIO. Do you have concern related to this subject?

Mr. BENJAMIN. This is a distinction that I think is not often enough made, particularly in some executive departments of the Government who are used to dealing with the Government Printing Office and think of a publisher as being merely a printer. Printing is only the beginning of the publishing operation. The publisher contributes a great deal usually to the quality and content of the work editorially before it is printed. Then he is responsible for getting the information about the publication in the proper channels through advertising, abstracts, index, and that sort of thing. Then, of course, he is responsible for distribution. This is particularly so abroad, as Mr. Wiley said. While a printer might produce one of these volumes and make some sort of announcement such as the Superintendent of Documents Office can make, and maybe sell a thousand copies, a

publisher whose imprint would mean something around the world and who would get out review copies of the book and proper notifications, would probably sell 100,000 copies. I do not know how many Government publications you have ever seen reviewed in the New York Times or in the professional journals. They just do not get reviewed and the information does not get around.

Mr. MILLER. We have not seen many government publications reviewed in the New York Times. However, this committee issued a report which was prepared by a group of prominent scientists that was a big seller. How many copies of the report did we have printed?

Mr. DADDARIO. You are talking about "Basic Research and National Goals." We have made a check on that. It was on the order of 9,000 copies.

Mr. BENJAMIN. This was the Superintendent of Documents.

Mr. DADDARIO. Yes.

Mr. MILLER. This was not advertised. It was not something we had to advertise or ask the New York Times to review. Scholars all over the country asked for it. The Italian Government asked to reprint it.

Mr. BENJAMIN. This is owing to the particular quality of this information. This is something they would come and get. But most of it they would not come and get.

Mr. MILLER. I think that scientists, educators, and people who would be interested in this publication, would come and get it. They would be very happy to get it. The Government is not in the business to make a profit on printing.

Mr. BENJAMIN. They would not come out and get it as much as the publisher could take it to them. A classic example is the Smyth report.

Mr. MILLER. If scientists, educators, and other people want this, they will come and get.

Mr. BENJAMIN. If they know about it.

Mr. MILLER. They will know about it. We are not a bit anxious to put the Government in the printing business and compete with you. I like your idea of subsidizing the little guy and bringing him up to the point where he can buy it. I am surprised that you do not start through the book publishers a foundation to subsidize these colleges.

Mr. BENJAMIN. That would be taking money out of one pocket and putting it in your sock.

Mr. MILLER. You are not, perhaps, too much interested in them. Some of the research institutes feel that the Government is encroaching on their business.

Mr. BENJAMIN. Sir, the industry make a very large contribution to higher education every year, including my own firm. We are making larger and larger contributions.

Mr. MILLER. I am quite conscious of what they do. I would suggest that your firm may follow a precedent established by one of the big aerospace firms that now makes these commitments not in cash but in Government bonds so that the Government gets a chance to use the money. I commend it to you.

Mr. BENJAMIN. Thank you, sir.

Mr. WILEY. I think there is quite a difference between the publishing industry and the aerospace industry.

Mr. MILLER. The direction of my questions has been to see if I could get some thread of thought which would lead us in the direction of overcoming some of the problems which have been raised by various members of the committee.

Mr. DADDARIO. I think that the testimony here has been extremely helpful in bringing to the attention of the committee that the private publishers do in fact have not only a stake in this, but a knowledge of how this information and transfer ought to take place. This has been developed over a long period of time and it is of extreme value to the committee as we try to put together the information necessary upon which to make final judgments. We will take into consideration what you have said, and if there is further information and advice we need, we will be in touch with you.

Are there any further questions? If not, I thank you both. Thank you, gentlemen.

ADDITIONAL QUESTIONS SUBMITTED TO MR. CURTIS G. BENJAMIN AND MR. W. BRADFORD WILEY BY THE SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT

Question 1. If the Bureau of Standards contracts with a commercial publishing organization to print and disseminate standard reference data, would the publishing organization expect to be allowed to copyright the data? Would it still undertake the contract if it were not allowed to copyright the material?

Answer 1. The only basis on which an American commercial publisher would be interested in publishing and distributing standard reference data would be under copyright.

Question 2. Dr. Hollomon testified that the duplication and sale of standard reference data by a commercial organization is permissible provided that the commercial organization does not use the "symbol or mark" on the publication. Under such circumstances, would a commercial organization duplicate and sell the material?

Answer 2. This question is covered by the reply to Question 1.

Question 3. On page 2 of your statement you state that "printing and dissemination under contract with a private agency or firm would save the government a great deal of money."

(a) Please explain.

(b) In the final analysis, aren't these "savings" passed on to the user in higher prices, and since the government sponsors the majority of research, it ends up paying the cost anyway—including the profit made by the publisher?

Answer 3(a). Costs of platemaking, printing, paper, binding and distribution would be direct saving. Royalty on sales would reimburse some of compilation and editing costs.

Answer 3(b). No. About half of the copies would be purchased abroad with no involvement of U.S. funds. About 25% would be purchased by libraries operating largely with state, local and institutional funds. Other purchases would be made by industry, not involved directly with government programs. We would estimate that about 80% of purchases of commercial editions would be made with non-federal funds. A special price for government purchases could be arranged.

Question 4. On page 3 of your statement you raise the question of the government's liability for inaccurate data.

(a) What would be the liability of a commercial publisher in such a case?

(b) Should there be a difference between the liability of a commercial publisher and the Federal government?

Answer 4(a). The liability of a commercial publisher would be the same as the government's, but a commercial publisher would not give an unnecessary warranty of accuracy.

Answer 4(b). No. We request that the proposal for a "mark" be eliminated.

Question 5. On page 4 of your statement you refer to a foreign organization duplicating and selling standard reference data.

(a) Please discuss the problems involved in terms of this bill.

(b) Would the copyright laws and treaties offer more protection?

Answer 5(a). Under the bill as now written, many foreign organizations could make changes, additions or deletions with impunity. The U.S. law can protect uses and integrity of data only in the U.S. Further, a foreign organization, not having composition and promotion costs, could produce an offset edition from the U.S. edition that would be much lower in price than the U.S. edition, and would preempt the foreign markets. Such an offset edition might even be exported to the U.S. with impunity, because there seems to be nothing in the bill that prohibits the importation of copies of the data produced legally abroad. In fact, this lack of protection against cheaply-reproduced foreign editions could make the production of U.S. commercial editions very unattractive, if not impossible.

Answer 5(b). Yes. U.S. copyright would give protection in all major countries of the world except the U.S.S.R. and Red China through the Universal Copyright Convention which gives automatic reciprocal copyright. A license would be required to reprint the copyrighted work in any foreign country, and the terms of the license agreement could protect both the substance and form of every reprint abroad. In fact, copyright is the only practicable way in which such protection can be obtained. The copyright does not have to be taken out by the Government; it can be taken out by the private publisher and assigned back to the Government agency or controlled by the Government agency by contract.

Question 6. *Is a commercial publisher capable of marketing standard reference data in the form of computer types or cards?*

Answer 6. Yes. Several commercial publishers have this capability and others could readily develop it.

Question 7. *In the normal situation where a commercial publisher publishes a document for a Federal agency, does the agency receive a royalty on sales or the use of a certain number of copies, or both? Please discuss and give examples if possible.*

Answer 7. In most cases royalty is paid directly into the U.S. Treasury rather than to the Federal agencies involved. In many cases the publishing contracts provide for specified numbers of further copies for Government use in addition to royalty payments. In other cases the contract provides for direct Government purchase at high rates of discount. In general publishers are flexible in contracting on terms that meet the particular needs of each separate case. In almost all cases the contracts require the publishers to sell the published works at stated prices, and in many cases the prices are fixed under competitive bidding. Below is a list of typical titles with a summary of the terms of royalty and allowances provided in each case.

Examples of books published by commercial publishers

Title	Agency	Publisher	Free copies to Government	Royalties paid to Government
"Vigilance: A Symposium," Donald N. Buckner and James J. McGrath, 1963.	Office of Naval Research.	McGraw-Hill.	25	None, 5 percent to author.
"Electronic Components Handbook," K. Henny, C. Walsh, and H. Mileaf; 1957-59.	Wright Air Development Command.do.....	1,000	10 to 15 percent of list price.

Atomic Energy Commission works

Title	Author and/or year published	Publisher
"Atomic Energy Encyclopedia in the Life Sciences".....	Charles Wesley Shilling, 1964.	W. B. Saunders Co.
"Sourcebook on Atomic Energy".....	Samuel Glasstone, 1958.	D. Van Nostrand Co.
"Atoms for the World".....	Laura Fermi, 1955.....	University of Chicago Press.
"Radiation and Immune Mechanisms".....	1964.....	Academic Press.

NOTE.—On these the recent standard royalty rate paid to the Government has been 15 percent of list price and the AEC has received 200 to 250 free copies.

Question 8. What percentage of the total sales of standard reference data do you expect would be made to foreign purchasers if such publications were sold and distributed by a commercial publishing organization?

Answer 8. At least 50% of initial sales would be abroad and it might run as high as 60%. In recent years 78% of the sale of the International Critical Tables published by McGraw-Hill has been abroad. Although sales records for the earlier years of this publication (the 1920's and the 1930's) are not available, McGraw-Hill estimates that 55% to 60% of total sales have been export sales.

Question 9. In your testimony you raised an objection to the symbol or mark as proposed in the bill. Since the symbol or mark represents a definable standard of quality or care, would it be preferable in your opinion to place at the beginning of each publication what the symbol or mark represents in lieu of the symbol itself (perhaps in the form of a letter signed by the Director of the Bureau)?

(a) *If this were done, would it involve fraud for a commercial publisher to republish the letter if the compilation were altered in such a way that the data no longer represented the same standards of quality?*

Answer 9. In our opinion the title of the work and the name of the Bureau of Standards would be sufficient to label the work for quality, but a prefatory statement by the Director of the Bureau would be more explicit and thus desirable.

Answer 9(a). We think so, but this opinion is given without advice of counsel.

Mr. DADDARIO. I would like to recognize for just a few moments Mr. John F. Haley, staff director of the Joint Committee on Printing. Mr. Haley.

STATEMENT OF JOHN F. HALEY, STAFF DIRECTOR, JOINT COMMITTEE ON PRINTING

Mr. HALEY. Thank you, Mr. Daddario. I am here at the direction of the vice chairman of the Joint Committee on Printing, Mr. Burleson. I am especially happy to see Mr. Miller here because I was going to read a brief letter addressed to him, failing to know he would be here.

Mr. MILLER. If you had notified me, I would have been sure to be here, Mr. Haley.

Mr. HALEY. That would have been an imposition because the letter is so short.

Mr. DADDARIO. Our chairman is psychic about these things.

Mr. HALEY. The letter addressed to Chairman Miller of the Committee on Science and Astronautics reads as follows:

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON PRINTING,
June 30, 1966.

Hon. GEORGE P. MILLER,
Chairman, Committee on Science and Astronautics,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: Reference is made to the bill H.R. 15638 on which hearings are currently being held before the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics.

It is recognized that the scope of the referenced bill includes much more than printing from which the bill seeks relief from compliance with the provisions of U.S.C. Title 44. Nevertheless, it is obvious that substantial benefit to the broad objectives sought by the bill can be obtained by utilizing the composition capabilities of the Government Printing Office.

It is suggested that the assessment of testimony received by your committee be made by the staff of the Joint Committee on Printing and submitted for inclusion in your printed hearings. Said assessment shall be recognized as the policy position of the Joint Committee.

Sincerely,

[s] OMAR BURLESON,
Vice Chairman.

May I add that the assessment will be made by the staff of the Joint Committee on Printing and have the concurrence of the Public Printer and officials of the Government Printing Office when submitted.

Mr. DADDARIO. I do not quite understand what you intend to make an assessment of, Mr. Haley.

Mr. HALEY. The assessment will be made with appropriate consideration being given to the use of existing composition capabilities of the Government Printing Office and the potential use of the high-speed electronic composition system yet to come. Workshops are currently being attended by representatives of departments for programing input to the system. Also, the existing authority contained in title XV, chapter 23 of the United States Code, the legal authority under which the Commerce Clearinghouse operates, will be considered in the assessment. Effective utilization of services obtainable from the Government Printing Office can contribute much to the achievement of the overall objectives desired by H.R. 15638. It may well be that assessment may show, Mr. Chairman, that composition and reproducible could be supplied by GPO to the Bureau of Standards which would contract with commercial publishers to do the printing and distribution, if advantage over distribution by the Superintendent of Documents is obtainable thereby. Printing by appropriated funds is the mission of the Public Printer, until otherwise ordained by the wisdom of Congress.

Mr. DADDARIO. The assessment, then, would be directed to advising this committee as it makes its deliberations as to the capabilities now available within the Government Printing Office. These capabilities we shall consider together with presently established laws, before we come to final determination as to what should be done under the bill before us.

Mr. HALEY. You could not be more precise. I may add, there is a big investment in the electronic composition system being placed in the Government Printing Office. With this system the Government Printing Office will soon be able to handle the output from many computers and convert this output at high speed into pages of graphic arts quality for printing. Information can be updated for subsequent fast revised printings. No commercial printing or composition facility has equal capability. So our position will be, as you said, Mr. Chairman, of an advisory nature.

Mr. MILLER. I would welcome your evaluation of this for the committee. If you or Mr. Burseson earlier had spoken to me about it, we might have arranged to have you officially represented here to advise us in this field. When you and I had a discussion about the bill, you felt that the bill should have gone to your committee. I do not blame you for that. The Parliamentarian assigned it to us. I think that printing is the mechanical part of the work that will take place. We

are primarily interested in the data that will be developed through this system that will be available to printing.

Mr. DADDARIO. Mr. Chairman, I do think that Mr. Haley's offer here is one which can be of great help.

Mr. MILLER. I am very happy to have it.

Mr. DADDARIO. We are pleased to have it, Mr. Haley, and we certainly will indicate this to Mr. Burleson.

Mr. MILLER. I would appreciate it if Mr. Felton would prepare a letter for my signature to Mr. Burleson expressing my thoughts on this matter.

(The letter referred to is as follows:)

JULY 1, 1966.

HON. OMAR BURLESON,
Vice Chairman, Joint Committee on Printing,
The Capitol, Washington, D.C.

DEAR MR. VICE CHAIRMAN: The committee will be pleased to receive the comments of the Joint Committee on Printing and the Public Printer concerning H.R. 15638, a bill to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data. As you are aware, the committee sent a letter to Mr. James L. Harrison, the Public Printer, on January 16, 1966, soliciting his comments on the bill.

It is the committee's understanding that the assessment of the testimony which you mention in your letter of June 30, 1966, will pertain to how the objectives of this bill might be better realized by utilizing the current and proposed composition capabilities of the Government Printing Office, and that this policy statement will be prepared in conjunction with the Public Printer and other officials in the Government Printing Office.

We appreciate your interest in H.R. 15638 and look forward to the statement.

Sincerely yours,

GEORGE P. MILLER, *Chairman.*

Mr. HALEY. May I add, Mr. Chairman, I said if it were wholly a printing bill it would necessarily be directed by jurisdiction to the Subcommittee on House Administration. You said it was many things, included in which would be the copyright law as well as title 15. We did not feel we were altogether circumvented.

Mr. MILLER. Is this the first meeting you have attended?

Mr. HALEY. Yes, sir; but our troops have been here every day.

Mr. MILLER. This is the first day we have discussed printing to a large extent and how the charges should be levied.

Mr. HALEY. I am sure there will be assistance furnished in the Government Printing Office, however indirect, in connection with this proposal.

Mr. VIVIAN. I would be interested in having some information on whether other activities of the Government are furnished to serve some sector of our economy and whether such activities are handled in such a way as to return a significant fraction of the cost back to the Government agency providing the service through the sale of publications. How many instances there are of this situation.

Mr. DADDARIO. Mr. Haley, that can be provided?

Mr. HALEY. Yes.

Mr. DADDARIO. Mr. Vivian has raised an interesting point.

(The information requested is as follows:)

The following excerpt is taken from the report on a study of the Federal printing program completed by the Joint Committee on Printing, January 25, 1966:

DISTRIBUTION BY CLEARINGHOUSE FACILITIES
Summary of clearinghouse facilities operated by departments and agencies (fiscal year 1964 statistical information)

Department or agency, bureau or subelement, and location of facility	Field or fields of specialization	Number of publications originated by facility	Total cost of operation	Source of acquisition of publications			Percent of total distributed to—	
				Other Government agencies	Non-Government-published publications funded by contracts or grants	Other Government agencies	Public	
				Criteria	Quantity acquired	Yes.....	7	93
Department of Commerce— National Bureau of Standards, Commerce Clearinghouse, Washington, D.C.	Scientific, technical, and engineering.	43	\$1,181,000	Review for current state of the art.	25 to 100 copies each.	Yes.....	7	93
Distribution of documents or text								
Department or agency, bureau or subelement, and location of facility	Field or fields of specialization	Distribution of documents or text			Sale of material			
		From	which issued	Total number of copies distributed	Average number of copies distributed	Total amount received from sale of material	Disposition of money received	
Department of Commerce— National Bureau of Standards, Commerce Clearinghouse, Washington, D.C.	Scientific, technical, and engineering.	Printed and Microfiche.....	1,477,000	50	\$2,744,000	Replenish trust fund.		

Category 2
Government sponsored or conducted writings turned over to commercial source subject to conditions and restrictions

Department or agency and bureau or subelement	Number of publications for which copyright resides with—				Permission to reprint part or all of publication			Percentage (average) of charges paid agency when publisher receives payment for reprint or translation rights	Justification of publishing commercially, in lieu of through GPO and Superintendent of Documents	Statutory and/or legal authority for commercial publication of manuscripts prepared at Government expense
	Author	Publisher	Author, but assigned to Government or Government official	Publisher, but assigned to Government or Government official	Publisher exercises discretion?	Publisher obtains agency approval?	Other			
Atomic Energy Commission.				33				50	<p>I. Selected publishers are those who concentrate on the scientific and technical fields and are able to market AEC books effectively in the United States and abroad through their usual channels.</p> <p>2. Books are published under arrangements by which the commercial publishers assume all manufacturing costs, furnish some free copies to AEC and return royalties to the Government.</p>	<p>The Comptroller General in his unpublished opinion addressed to the Public Printer dated Jan. 20, 1950 (B-88444), affirmed the propriety of private commercial publication of AEC-sponsored scientific books where no expenditure of Government funds for printing and binding is involved. The Comptroller General's opinion cited the broad authority contained in the Atomic Energy Commission Act of 1946, as amended, and referred specifically to provisions now found in secs. 3(b) and 141(b) of the Atomic Energy Commission Act of 1954 (42 U.S.C. 2013b and 2161b).</p>

1 Publisher must submit to AEC all denials for reproduction.

COMPTROLLER GENERAL OF THE UNITED STATES,
Washington, January 20, 1950.

XXXXXXX

Hon. JOHN J. DEVINY,
Public Printer.

MY DEAR MR. DEVINY: Reference is made to letter of this Office, XXXXXXX dated August 25, 1949, wherein you were advised that an investigation would be made into the propriety of certain contracts referred to in your letter of July 29, and that action would be taken by this Office in accordance with the results of such investigation.

Inasmuch as the Office of Scientific Research and Development, as such, no longer is in existence and because of the similarity of the contracts involved, the investigation was limited to the contract between the Atomic Energy Commission and the Trustees of Columbia University, and a related contract between the Atomic Energy Commission and the McGraw-Hill Book Company, Inc.

Contract No. AT-30-1-GEN-72 between the Atomic Energy Commission and the Trustees of Columbia University provides for studies and investigations in the field of nuclear physics. By supplemental agreement No. 4 dated October 15, 1947, such contract was amended to provide, in substance, that the contractor arrange for the publication of a technical series of declassified reports and possibly a technical series of classified reports concerning atomic energy research with the provision that the Atomic Energy Commission furnish, at its own expense, all copy in final form for photographic reproduction. Pursuant to such supplemental agreement, the Trustees of Columbia University, on May 24, 1948, by subcontract No. 4, contracted with the McGraw-Hill Book Company, Inc., for the publication, sale and distribution of the "National Nuclear Energy Series" as approved for release to the public by the Atomic Energy Commission. The subcontract also sets forth that the Atomic Energy Commission shall provide the master copies of each volume with pages scaled according to specification; that the subcontractor will bear the expense of publication, sale, and distribution; will pay to the Treasurer of the United States specified royalties upon copies sold; will negotiate with the Atomic Energy Commission on the basis of actual cost for the delivery of copies of a restricted edition; and, as amended, by modification No. 1, will furnish 500 free copies of each volume to the Atomic Energy Commission.

Contract No. AT-40-1-GEN-209 between the Atomic Energy Commission and McGraw-Hill Book Company, Inc., provides that the latter will be reimbursed on a cost-without-profit basis for its expenses in furnishing the services of its employees in connection with the preparation for publication of the "National Nuclear Energy Series."

By letter of October 26, 1949, the Chairman, Atomic Energy Commission, was invited to furnish an expression of his views with regard to the propriety of securing the publication of the "National Nuclear Energy Series" in the manner outlined above. In reply thereto, the Chairman, by letter of November 14, 1949, outlined in detail the problems involved in producing the publication in question. It appears from a reading of said letter that, in pursuing such course, the Commission relied on the provisions of section 1(b)(2) of the Atomic Energy Act of 1946, approved August 1, 1946, 60 Stat. 756, wherein it is stated that one of the purposes of the act is to provide "A program for the control of scientific and technical information which will permit the dissemination of such information to encourage scientific progress," and section 10(a)(2) thereof which provides "That the dissemination of scientific and technical information relating to atomic energy should be permitted and encouraged so as to provide that free interchange of ideas and criticisms which is essential to scientific progress." Also, it is pointed out by the Chairman that the furnishing to the Atomic Energy Commission of 500 copies of each volume, and publication, sale and distribution of the volumes is to be performed without cost to the Government and that plans to publish a classified series have been abandoned. It is further explained, in effect, that the services for which reimbursement was made to the McGraw-Hill Book Company, Inc., were not reproduction or publication services such as your Office is prepared to furnish but were professional editorial services performed in the preparation of the manuscript. Also, it appears that the special composing typewriters used to arrange the manuscript in final form for photographing were

property of the Commission and constituted no part of the cost for which the contractor received reimbursement.

In view of the broad authority conferred upon the Atomic Energy Commission by the act of August 1, 1946, *supra*, and since the contracts in question do not involve an expenditure of Government funds for costs of actual printing and binding, it does not appear that this Office would be justified in taking any further action in the matter.

Sincerely yours,

(Signed) LINDSAY C. WARREN,
Comptroller General of the United States.

Mr. HALEY. Thank you for your time.
(The analysis referred to by Mr. Haley follows:)

JULY 14, 1966.

HON. GEORGE P. MILLER,
*Chairman, Committee on Science and Astronautics,
U.S. House of Representatives,
Washington, D.C.*

DEAR MR. CHAIRMAN: Reference is made to your letter dated July 1, 1966, relating to H.R. 15638, a bill to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data and specifically to Section 5 of this bill which would authorize the production and sale of the referenced material without having to comply with pertinent sections of U.S.C. Title 44.

In consonance with the understanding stated in your referenced letter, the Joint Committee on Printing is pleased to furnish its views on H.R. 15638, which are concurred in by the Public Printer and other interested officials in the Government Printing Office.

The stated purpose of H.R. 15638 is to strengthen and enhance the policy of Congress to make critically evaluated reference data readily available to scientists, engineers, and the general public. In order to achieve this objective, the Joint Committee on Printing is concerned regarding the language of the bill which would disregard the provision of section 11 of the Act of May 1, 1919 (ch. 86, 40 Stat. 1270; U.S.C. 111) and thereby permit printing to be done elsewhere than at the Government Printing Office.

The present capability of the Government Printing Office for type composition is already the largest and most varied of any single printing facility. With the addition of the Electronic Composing System, now being acquired by that office, the composition capability will be the most advanced in any printing facility in the world. The Electronic Composition System will accept information recorded on magnetic tape and output this information at a speed of up to 1,000 characters per second in the form of complete typeset pages on film ready for platemaking and printing. The system is part of a total Government-wide system of recording, storing, and retrieving information by the use of computers and associated devices. It is the fruit of four years of effort by the Federal Electronic Printing Committee, the membership of which includes a representative of the Department of Commerce. Since the Standard Reference Data compilations will almost certainly be produced from computer sources, the Electronic Composition System offers the capability of producing economically a printout of high graphic arts quality at high speed from computerized data. The speed and ability to update information offered by the system cannot be equalled by the employment of other composition methods.

Under the existing authority of sections 1152 and 1156 of Title 15, U.S.C., the Commerce Clearinghouse of the Department of Commerce can take the data produced by the Bureau of Standards and achieve effective publication and distribution by the following procedure whenever sale and distribution by the Superintendent of Documents is not desirable:

1. The Bureau of Standards can furnish manuscript and/or tape to the Government Printing Office.
2. The Government Printing Office can perform composition for and deliver reproducible on film to the Bureau of Standards. (B.S. thus controls quality and format in presentation of data.)
3. The Bureau of Standards can sell reproducible to any and all persons who will agree to publish the material using the reproducible sold to them at Bureau of Standards price and who agree not to make alterations in the pages.

4. Publishers can print from reproducibles obtained from N.B.S. and sell books at a competitive price. (Each publisher to publish in whatever form his customers prefer. That is, all in one volume or in separates according to data desired by customers. Paper covers, hard bindings, loose leaf, and patent binders are possible forms that may be found desirable.) Publishers may add annotations to the data or include supplementary matter of their own, and copyright their part of the compilation.

The procedure outlined above suggests that GPO may be utilized to the best interests of the Government and the taxpayer; the Bureau of Standards may recover a substantial part of its cost or as much as has not already been contributed by the taxpayer; commercial publishers perform their proper function; and users get the data they need at a reasonable price.

In assessing the testimony of witnesses who participated in the hearings on H.R. 15638 on June 28-30, it cannot be understood how benefit to the Government may be obtained by circumventing pertinent sections of U.S.C., Title 44, referred to in Section 5 of the bill.

Sincerely yours,

OMAR BURLISON,
Vice Chairman.

Mr. DADDARIO. This subcommittee will adjourn to the call of the chairman.

(Whereupon, at 12:02 p.m., the subcommittee adjourned, to reconvene at the call of the chairman.)

APPENDIXES

APPENDIX A

SUMMARY OF TESTIMONY

June 28, 1966.

WITNESS: DR. DONALD F. HORNIG, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY

A. Highlights of statement

1. It is essential for the efficient conduct of the national research and development program that standard reference data measurements recorded in scientific literature be collected and made available to scientists and engineers.

(a) Failure to find data which the user can trust results in either re-running experiments, over-design of components, faulty and wasted products, or abandonment of the effort.

(b) Many large industries and government laboratories have for years maintained their own scientific staff to produce compilations of measurement data.

(c) By using compilations, scientists and engineers have ready access to data and save time and effort.

2. In addition to the indicated effort both within and outside of the government, we still need a standard reference data program under the management of the National Bureau of Standards.

(a) No one group has undertaken to assess the total standard reference data needs of the national research and development community and to insure that these needs are being met. In some areas, compilation is inadequate or duplicated.

(b) The methods of making such information readily available have been overtaken by the advance of technology itself—increased complexity and volume of information and use patterns of data—need to up-date data.

(c) The task is to organize disparate efforts and apply modern techniques to an existing activity which is not being done well.

3. Complicating factors to making standard reference data readily available:

(a) Availability of scientists and engineers.

(b) Complexity of science and technology.

(c) More diverse and frequent use of standard reference data.

4. A closely coordinated program of government and private data collection, evaluation, compilation, and dissemination efforts is needed.

5. Background: In 1963 the NBS was given the responsibility for a government-wide program, named the Standard Reference Data System, to develop critically evaluated data in the physical sciences and technology and to insure its ready access for the benefit of the scientific and technological community in the United States. To meet their needs, new activities are required of the Department of Commerce and these are provided for in the Standard Reference Data Act.

6. The Standard Reference Data Program is part of the national network of science and technology information systems.

B. Highlights of the questioning

1. It is important that the publication of standard reference data be a continuing activity.

2. It is hard to estimate the returns. However, a research program cannot be carried out without this data. Returns have been estimated from 10 to 1 to 100 to 1.

3. Sees nothing in the bill to bar the private sector from participating in this program.
4. Does not think the government would be "guaranteeing" the information, but would be judging it as the most reliable information the best experts have been able to determine.
5. Thinks that as the private sector develops information, there is certain data which they would make available, and there is other data of a proprietary interest which would not be made available and should not be.
6. Thinks that the use of reasonable use charges is one of the best ways of determining the value of services performed.
7. The areas to be dealt with will be determined by two things:
 - (1) Precise data must be needed by someone.
 - (2) Data much better than what has already been attained must be needed.
8. The main reason that new legislative authority is required for the standard reference data program is that to make the program viable in terms of future funding, it is important to have the general expression of intent by Congress that this service should be performed.
9. Thinks the user should bear some cost of providing the services.
10. Thinks the effort is to get the widest possible dissemination of data. Thinks the bill provides authority to restrict under some circumstances—such as a compilation of data for one customer.
11. Thinks the word "copying" in 7(b) really should be interpreted as commercial republication.
12. The evaluation will be performed by a spectrum of people engaged—people working in the scientific field all the time and primarily evaluating and people doing more mechanical compilations.
13. The Federal Council was unanimous in believing that the NBS ought to play the central role in setting standards and in coordinating the data gathering activities.
14. At present the SRD Program needs a much bigger and more comprehensive effort. Thinks that as long as there are significant and valuable needs not being met, it's time to expand.

June 29, 1966

WITNESS: DR. J. HERBERT HOLLOMON, ASSISTANT SECRETARY OF COMMERCE FOR SCIENCE AND TECHNOLOGY.

A. Highlights of statement

1. Brief explanation of why standard reference data are important:

(a) Important in dealing with national problems: space vehicle design, transportation, pollution, corrosion, safety, health, contamination.

(b) Problems if standard reference data is not available:

(1) Duplication of work, with no guarantee of greater accuracy.

(2) Overdesign to compensate.

(3) Uncertainty and inaccessibility are costly; they waste money, time and manpower. The present lack of a comprehensive, effective standard reference data system costs the Nation hundreds of millions of dollars a year. This is because the work that an integrated, comprehensive system could do is already being done in a piecemeal, uncoordinated, usually less effective manner by every member of the technical community. A standard reference system could return an estimated \$20-200 for each dollar spent on it.

2. Why we are seeking this legislation to expedite the national program of production and dissemination of standard reference data.

(a) Existing mechanisms for producing critically evaluated compilations have not been able to keep up with the flood of new data appearing in the literature.

(b) Lack of coordination and standardization of numerous data compilations and the high cost of failing to meet the need for a better mechanism to produce critically evaluated data are reasons behind the establishment of the Standard Reference Data System in 1963, to be administered by NBS.

(c) The Standard Reference Data System is considered to be one of the components of a broad national scientific and technical information system now being developed by the Committee on Scientific and Technical Information of the Federal Council for Science and Technology.

(d) During the three years that NBS has served as administrator of the SRDS, a good start has been made. These years have revealed the need for additional authority from Congress to increase effectiveness.

(e) The proposed legislation provides mechanisms for the necessary funding of the program through a combination of Congressional appropriations and user charges.

(f) Penalties for unauthorized publication and sale of compilations bearing the symbol would serve to maintain its integrity as well as to protect the system of user charges.

WITNESS: DR. ALLEN V. ASTIN, DIRECTOR, NATIONAL BUREAU OF STANDARDS

A. Highlights of statement

Dealing with the way the NBS plans to implement the proposed legislation.

1. Some time ago, COSATI and the Federal Council for Science and Technology endorsed a policy calling for NBS to assume responsibility for the administration of the standard reference data system.

2. The goal of SRDS is to provide to the technical community of the United States optimum access to critically evaluated quantitative data on the physical and chemical properties of substances and their interactions.

3. Since FY 1964, NBS has conducted SRDS activities along the following plan of operations:

(1) The planning and implementation of a series of data compilation activities organized according to technical scope.

(2) An information systems design and research activity.

(3) A variety of specialized information services to be provided to the technical community.

4. Continuing efforts have been initiated to establish and promote effective working relationships with program officers in other government agencies in order that NBS programs might be responsive to the needs of these agencies.

5. NBS present estimate of the level of expenditures required to satisfy the high-priority needs of U.S. science and technology is 4-5 times the present level of \$4 million for all participants in the program and \$1.5 million for NBS.

6. The proposed SRD Act would enable NBS to apply user charges to the costs of the program—estimated as a significant, but not large, fraction of the total cost of operation.

7. Alternatives in the development of SRDS:

(a) Continue present system: Hundreds of millions of dollars will be unnecessarily spent in the achievement of those goals unless SRDS is effectively implemented.

(b) Set narrower goals: The goals of the SRDS have been circumscribed by the definition of the technical scope of the program—extending only to cover intrinsic properties of well-defined substances and their interactions. The goal of the five year program is to achieve 90 to 95 percent coverage of all the properties which are determined to be of high priority by surveys and consultations with specialists.

(c) Set broader goals: To include other types of data would double or triple the resources in money and manpower required. Thus, no plans have been made within NBS to enlarge the program.

(d) Rely on other approaches to the scientific information problem: It is unlikely that the work of these organizations can make any significant contribution to the numerical data problem for 5 to 10 years.

B. Highlights of questioning (of both Dr. Astin and Dr. Hollomon)

1. The numerical data information effort is complementary to the broader information effort. It has more immediate benefits and should be gone ahead with.

2. Wish to recover by user charges the significant part of the cost of the materials, the printing, and the reproduction, and some part of the editorial and compilation costs—on the average, 20 to 25 percent, ranging from 20 to 60 percent on a given volume. Under the present authority, NBS has the ability to recover substantial direct costs and some of the associated costs. If the costs were not recovered, the more services rendered, the less money would be available to develop new methods and projects. The charge also helps to determine the user need. Thinks there would be no difference in charges to nonprofit institutions.

3. The charge would not be what the market would bear, but would be based on a judgment as to the degree to which this data were critically needed, and, to some degree, how many possible customers there are. In a special service for one customer, the user would be expected to pay full cost. In no case, does NBS intend to recover more than the costs.

4. Section 7(b) makes it illegal to copy any data compilation bearing the mark, and Dr. Hollomon suggests that the word "copy" be changed to "reproduce for sale."

5. The bill would permit private organizations to publish and use the mark at the consent of the Secretary so long as they meet the required standards.

6. Would like to use user charges as a means of encouraging private publication where possible, perhaps asking for bids from private publishers.

7. (Mr. Farrar) Thinks that the only thing that the Government "guarantees" is the fact that the data has been critically evaluated. Doesn't think the Government could be sued. Would not be opposed to the inclusion of an exculpation clause in the publication.

8. New capability included in the bill are section 4 that allows the Secretary to provide criteria for the publication by anybody else of standard reference data and section 5 which provides for user charges and printing outside of GPO.

9. There are two reasons to print outside the GPO:

1. to recover user charges.

2. to permit private publication of compilations in some cases.

10. If something is printed in GPO, the government can charge up to 150 percent of the cost of printing. The funds would go to the treasury.

11. Thinks that the bill prohibits the republication of data compilations with the mark but not without the mark.
12. There is precedent for the authority granted under the bill relating to the adoption of a symbol or mark by the Secretary, the imposition of civil penalties for its unauthorized use, and obtaining an injunction to prevent and restrain violations of the Act.
13. Intends to recover evaluation costs under some circumstances, but not research costs.
14. The decision to make compilations will be based on the need for the information rather than on the basis of how many people will buy it.
15. Thinks that, in special cases, NBS could furnish a request for one customer at full cost without depleting the appropriations.
16. Believes that over a 4- or 5-year period the level of the expenses to operate the system will be on the order of \$20 million a year.
17. Thinks that this bill is an exception to the copyright law by statute.
18. Would not object to limiting the time for which the mark would be valid. Intends to use a mark which contains a date.

JUNE 30, 1966.

WITNESS: DR. FREDERICK SEITZ, PRESIDENT, NATIONAL ACADEMY OF SCIENCES

A. Highlights of statement.

1. Background:

(a) An effort to provide critical tables of standard reference data, International Critical Tables of Numerical Data of Physics, Chemistry, and Technology, was determined impossible to repeat in 1955 due to

- (1) Expanse in size of scientific fields and in data requirements
- (2) Need for increased preciseness of data.
- (3) Estimated task at 100-200 times the size of the original task
- (4) Need for continuity
- (5) Other data-compiling projects involving annual expenditures of

about \$1 million.

(b) Recognizing the need for central planning, NAS—National Research Council created in 1957 the Office of Critical Tables. It was assigned among other things, the stimulation of new compilation projects. It failed in this one aim because no agency was able to provide the necessary funding.

(c) The establishment in 1963 of SRDS at NBS was the beginning of a strong central coordination and management center which would, hopefully, receive adequate funding.

2. Evaluation of data is an international problem. NAS has helped to create an International Coordinating Committee for Data in Science and Technology to stimulate programs in other countries.

3. NAS and the scientific and technical community it represents are in full agreement with the overall purposes of the bill.

(a) Stresses that SRDS is a cooperative program. Non-government laboratories, both university and industrial, are included.

(b) Expresses concern about 7(b) which could, if not watched, serve as a deterrent to a free flow of scientific data.

(c) Is in accord with fair remuneration for sale of some of NBS work. Is concerned about the possibility that charges might become so great that individuals of organizations might be prevented from having the volumes.

(d) Is concerned about section 6. Thinks Government may be subjecting itself to criticism if erroneous data should find its way into compilations bearing the mark. Thinks that debate concerning correctness of data should be a continuing process, and a mark should not be allowed to stop this.

B. Highlights of questioning

1. Does not think it is necessary to have a symbol associated with the data compilations. Feels that the fact the compilations come from these volumes, whose quality is well known, will serve the same purpose.

2. Thinks the material should be made available at a reasonable fee.

3. Thinks the data compilation project would be ideally handled by NBS.

WITNESSES: CURTIS G. BENJAMIN, CHAIRMAN OF THE BOARD, MCGRAW-HILL BOOK CO., INC., AND W. BRADFORD WILEY, PRESIDENT, JOHN WILEY AND SONS, PUBLISHERS

A. Highlights of statement

1. Support the general purpose of the bill.
2. Are in accord with the idea that those who make use of special services for standard reference data should make a contribution to the cost.
3. Believe the Committee should consider the following questions:
 - (a) Think it is possible to include the private sector quite heavily.
 - (b) Question whether it is proper for the government to put what is in effect an official imprimatur, the mark, on any scientific data. Feel that the publication of the data under the auspices of the Bureau will be well known and that the mark will be unnecessary.
 - (1) Is the mark a guarantee?
 - (2) Is it a trademark? If so, is use of a Federal trademark legal?
 - (3) Does it establish a precedent for a U.S. Government "seal of approval"? Will all other Government information be considered "Grade B"?
 - (4) How will it psychologically affect the ranking of similar non-approved data issued by private groups?
 - (c) Sections 6 and 7 involve a bypass of the copyright law.
 - (1) Feel this will invite similar circumventions in the in-house production of other kinds of scientific and technical information generated by the Government.
 - (2) Feel that the data should be protected by copyright—
 - (a) To protect interests of private and foreign contributors.
 - (b) To allow commercial publication.
 - (c) To protect against foreign republication for sale.
 - (d) To protect use in computers.
4. Production of a federally supported SRDS by NAS would be more palatable to private publishing industry than would in-house production by the Bureau of Standards. NAS, as a contracting agency, could copyright the data.
5. Scientific and technical book publishers have been very concerned over what they consider unfair Government competition. Since such a large percentage of research is funded with Federal funds, the private sector should publish the results of these efforts in order to prevent what could become a Government monopoly of scientific and technical information.
6. The private sector procedure would lead to some recovery of costs, although it is too difficult to estimate how much of the recovery would be in the form of royalties paid by a private publisher. Some recovery would be in the form of cost savings in production, printing, and distribution.

B. Highlights of questioning

1. Thinks that the U.S. should recover 50 to 60 percent of any expense of preparing the material from foreign customers.
2. The only control over copying in foreign countries would be copyright protection.
3. The technical publishers would prefer to have everything possible done outside of Government agencies.
4. The private publishing industry is concerned about the possibility of government preemption of basic scientific and technical data publication.
5. Feels that the government should subsidize the low ability consumer rather than subsidize 90 percent of the market by charging a very low price to get it down to the level of the lower 10 percent of the market.
6. Thinks the private publisher would do a better job of disseminating the data to the customers.

WITNESS: JOHN F. HALEY, STAFF DIRECTOR, JOINT COMMITTEE ON PRINTING

A. Highlights of statement

Recommends that there be an assessment of the use of composition capabilities presently at the Government Printing Office.

PERTINENT COMMENTS OF WITNESSES ON H.R. 15638

Section 1. Dr. Hollomon states that this legislation is needed because existing mechanisms for producing critically evaluated data compilations have not been able to keep up with the flood of new data appearing in the literature, NAS and the scientific and technical community it represents are in full agreement with the overall purposes of the bill. Mr. Benjamin and Mr. Wiley support the general purpose of the bill.

Section 2. No pertinent comments.

Section 3. Dr. Hornig states that the Federal Council was unanimous in believing that the NBS ought to play the central role in setting standards and in coordinating the data gathering activities. Dr. Seitz thinks that the data compilation project would be ideally handled by NBS. Mr. Benjamin and Mr. Wiley would prefer for NAS to handle the project and to copyright the data. They consider the provisions of the bill unfair government competition.

Section 4. Dr. Hollomon and Dr. Astin state that this is new authority provided for the Secretary to provide criteria for the publication of compilations by anybody else.

Section 5. Dr. Hornig sees nothing in the bill to bar the private sector from participating in this program. He thinks that the use of reasonable use charges is one of the best ways of determining the value of services performed and that the user should bear some cost of providing the services.

Dr. Hollomon and Dr. Astin wish to recover by user charges a significant part of the cost of the materials, the printing, and the reproduction, and some part of the editorial and compilation costs—on the average 20 or 25 percent, ranging from 20 to 60 percent on a given volume. If the costs are not recovered, and the more services rendered, the less money would be available to develop new methods. The charge would be based on a judgment as to the degree to which this data were needed and, to some extent, how many possible customers there are. In a special service for one customer, the user would be expected to pay full cost. In no case does NBS intend to recover more than the costs.

Dr. Hollomon and Dr. Astin state that the bill would permit private organizations to use the mark with the consent of the Secretary so long as they meet the required standards. They state that this section provides a new authority to bypass GPO and to place user charges on the data. There are two reasons to bypass GPO: to recover user charges and to permit private publication of data in some cases.

Dr. Seitz agrees with fair remuneration for sale of some of NBS work but is concerned about the possibility that charges might become so great that some customers would be unable to purchase volumes.

Mr. Benjamin and Mr. Wiley agree that users of special services of the program should make a contribution to the cost. They feel that the government should subsidize the low ability consumer, rather than lower the price of all volumes within his reach. They feel that the private publishers would do a better job of disseminating the volumes.

Mr. Haley recommends that there be an assessment on the use of composition capabilities presently at GPO.

Section 6. Dr. Hornig does not think the government would be "guaranteeing" the information with a mark, but would be judging it as the most reliable information the best experts have been able to determine. Mr. Farrer states that the only thing the government "guarantees" is that the data has been critically evaluated. Dr. Seitz thinks that use of the mark may subject the government to criticism if erroneous data should find its way into compilations. He thinks that the mark may be a deterrent to continuing debate concerning correctness of data. He does not think the mark is necessary and feels that the reputation of the volumes will be sufficient to serve the same purpose. Mr. Benjamin and Mr. Wiley agree that the reputation of the volumes will suffice, and that the mark is unnecessary.

Section 7. Dr. Hornig thinks that the word "copy" in 7(b) should be interpreted to mean commercial republication. Dr. Hollomon states that 7(b) makes it illegal to copy any data compilation bearing the mark and suggests that the word "copy" be changed to "reproduce for sale." He thinks that the bill prohibits republication of data compilations with the mark but not without the mark. He feels that this section provides, in effect, for an exception to the copyright law. Dr. Seitz expressed concern that 7(b) could, if not watched, serve as a deterrent to a free flow of scientific data. Mr. Benjamin and Mr. Wiley feel that the data should be protected by copyright to protect it against foreign republication and to allow commercial publication of the volumes.

Section 8. Dr. Hollomon states that penalties for unauthorized publication and sale of compilations bearing the symbol would serve to maintain its integrity as well as to protect the system of user charges.

Sections 9, 10, and 11. No pertinent comments.

APPENDIX B

PERTINENT ARTICLES BY CURTIS G. BENJAMIN

COPYRIGHT AND GOVERNMENT¹

"A Sea of Troublesome Questions"

(By Curtis G. Benjamin)

Mr. Benjamin, chairman of the board of the McGraw-Hill Book Company, has long been familiar with the problem of publishing Government-sponsored books. Over the years, many more of such books have been published by his firm than any other. For six years he served as chairman of the book industry's Joint Committee for Copyright Affairs. He has also served as advisor to several Federal agencies, including the National Science Foundation, the Atomic Energy Commission, the US Office of Education, the President's Science Advisory Committee, and the Department of State.

The language of the US Copyright Act of 1909 was carelessly vague in several places, but most of these lapses have been corrected by subsequent legislation or by key court decisions. Strangely enough, the lapse that most directly involves the Federal Government still persists, much to the frustration and dismay of publishers, authors, and Government officials.

Section 8 of the Act decreed that "No copyright shall subsist . . . in any publication of the United States Government," but Congress forgot to define its terms. What is a "publication of the United States Government"? Official documents and Government records? Speeches and books by Federal employees? Reports on Government-sponsored research? Textbooks developed by Government-funded curriculum committees?

The answers have never been clear, and in attempting to improvise some practical rules of thumb, both Government agencies and the publishing industry have shown a confusing inconsistency. In the years ahead, the Government's massive commitment to scientific research and curriculum reform—including the development of new information systems and new teaching tools—threatens to pose even more complex copyright problems. Unless the new copyright bill now

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being considered by Congress can present some precise but flexible guidelines, the resulting legacy of vagueness will preclude the chance for effective and mutually profitable cooperation between the Government and the publishing industry on literally hundreds of publishing projects of crucial importance to science, technology, and education.

A few case histories will serve to indicate the dimensions of the problem, and to suggest a possible solution. The history of the 1909 Copyright Act suggests that Congress meant the "no-copyright" policy to apply only to publications of the Government Printing Office. But over the years the GPO gradually evolved into a publishing giant that prints and sells "official documents" on subjects ranging from a perennially popular booklet on how to raise guppies to a recently published 627-page compilation of *The Collected Papers of Sir Thomas Havelock on Thermodynamics*. (One has to admire the bureaucratic adroitness with which this classical work of a British scientist has been transmuted into an "official" US publication.) Over the same years the no-copyright policy for GPO publications has gradually lost status, and now many such publications appear with notices of private copyright. Among them are two very official Congressional publications that have been printed by the GPO and privately copyrighted by specially privileged people: *Cannon's Procedure in the House of Representatives*, by the former Speaker Clarence Cannon, and *Senate Procedure, Precedents, and Practices*, by Charles L. Watkins, Parliamentarian of the US Senate. Both of these "crony" copyrights were authorized by special acts of Congress.

In more recent years two other viewpoints have emerged in this area of copyright problems. Both have strong support among people who are convinced that they are safeguarding the public interest. The first argues that no private copyright should be allowed in any publication on which Federal funds have been spent by contract or grant, either directly or indirectly. The second holds that no government employee should be allowed to copyright any work that he produces in the general area of his official responsibility.

Until 1958 all these positions, both old and new, were occasionally debated but successfully skirted with only a few confrontations between authors, publishers, and Government officials. Then came the angry and noisy *Public Affairs Associates Inc., v. Rickover* case that brought squarely to court the question of what is or is not a "publication of the United States Government." In hearing this case, which centered on whether certain of Admiral Rickover's public addresses and lectures were entitled to copyright protection, the US Court of Appeals once again referred to the regrettable vagueness of Section 8, remarking ruefully that it "creates a sea of troublesome questions."

Admiral Rickover and his antagonist, M. B. Schnapper, proprietor of the Public Affairs Press, have quieted down a bit while their case lags in an indecisive, legalistic limbo. But the sea of troublesome questions has continued to churn about in the debate about the proposed new Copyright Act of 1965. This bill was introduced in Congress last February after more than five years of careful and intelligent preparation by the Register of Copyrights, Abraham L. Kaminstein, and his associates in the US Copyright Office. It represents the first overhaul of our copyright law since 1909, and the hands that drafted it have

been much more specific than were their counterparts in 1909. Still, the new bill leaves open several important questions concerning copyright in publications written by Government employees or financed by Government funds. If the Act is passed without changing the present language of its Section 105, dealing with United States Government works, these questions will have to be settled later by the courts. The process will be costly, slow, and perhaps harsh in many instances. This is certainly an inelegant solution.

The first major question involves works written by Government employees. The new bill defines a "work of the US Government" as one "prepared by an officer or employee of the United States Government within the scope of his official duties or employment." While this language is quite specific, it is somewhat broader than that of an earlier draft of the bill, in which the concluding words were: "*as part of his official duties*" (italics mine). Many of us publishers believe that the earlier version leaves less room for uncertainty and contention.

For example, under the proposed definition, would J. Edgar Hoover, in writing his best-selling books on Communism, be producing "works of the US Government"? One can argue that combating Communism in the US is within the scope of Mr. Hoover's duties as director of the FBI, and that alerting the public to the existence and methods of communist infiltration is within the scope of his job. If that is so, would the private copyrights in Mr. Hoover's books be valid?

Similarly, it could be debated whether a professor at the US Naval Academy had produced a "work of the US Government" when he wrote and copyrighted a highly successful text in mathematics. The author has successfully maintained that his official assignment was to teach students; that this responsibility did not extend to his writing of the textbook; that in fact he wrote the text merely to provide himself with a tool for better teaching. Yet it could be argued that the preparation of the text came "within the scope" of his employment at Annapolis.

One of the most noted and debated of private copyrights in Government-sponsored publications is held by Professor Henry D. Smyth for his book, *Atomic Energy for Military Purposes*. Described in its subtitle as "The Official Report on the Development of the Atomic Bomb under the Auspices of the US Government," this historic report was written for the Atomic Energy Commission and published in 1946 by the Princeton University Press. AEC officials, recognizing the book's potential impact and public appeal, authorized Professor Smyth to publish a commercial edition simultaneously with an official GPO printing. Both carried a private copyright notice.

The GPO edition in paper covers was priced at 40 cents; the commercial edition was published in cloth binding at \$2, and later in paper covers at \$1. In spite of the higher prices, the Princeton University Press editions outsold the other by a wide margin: 125,000 copies as against 40,000. The GPO edition, last reprinted in 1950, is now out of print, but the Princeton cloth-bound edition is still in print and in steady demand at \$4 per copy.

The success of the commercial editions of the Smyth Report apparently convinced AEC officials that there might be more to publishing a book than just printing it. The AEC now contracts for commercial

publication of many of its important technical works. Three multi-volume series and over 100 individual books and technical reports have since been published successfully in this way.

The second major question involves works that have been produced (that is, written or compiled) with Government financial assistance. In the past 40 years, literally hundreds of such works on which Federal funds have been spent in one way or another have been published and copyrighted privately by contractors or grantees. These range from the two great Hoover Commission reports of the 1930s, *Recent Economic Changes* and *Recent Social Trends*, to the monumental *Education Media Index*, an \$80 directory which was compiled and published last year by a private firm under contract with the Educational Media Council, which was operating with US Office of Education funds.

Outstanding among the many examples of cooperation between Government and the publishing industry that occurred in the postwar years is the MIT *Radiation Laboratory Series*. This landmark series, probably the most important technical work on a single subject ever produced in the US, was proposed late in 1944 by Dr. I. I. Rabi, then associate director of the Radiation Laboratory at MIT. He thought it was imperative that the millions of Federal dollars and the priceless man-hours of the country's finest scientific minds that were spent on the wartime work on radar at the Laboratory should lead to more than a series of routine reports printed by the GPO. He envisioned an important, carefully prepared, systematic work—something rather like the great German *Handbuch der Physik*.

Dr. Vannevar Bush, wartime director of the Office of Scientific Research and Development, carried the idea to the Congressional Joint Committee on Printing, which agreed that publication of the proposed series would be better accomplished by a commercial firm. Dr. Bush then obtained an OSRD appropriation of \$500,000 to finance the estimated cost of preparing manuscripts and illustrations for a 27-volume series.

The leading technical publishers of the country were invited to submit competitive bids, and a publishing contract was signed just seven months after the Japanese surrender. The publisher sent to MIT a resident editor who helped to establish editorial style and standards, and later guided the routines of manuscript production, copy editing, and proofreading. For this editorial help, and for its substantial investment in production, promotion, and sales costs, the firm was granted an exclusive copyright on each volume for ten years, which was estimated as the span of prime scientific value of the work. In turn, the publisher agreed to pay into the US Treasury the usual author's royalty and to provide a required number of free copies for official use by the OSRD.

The 27 manuscripts were scheduled for completion in six months, with publication to follow six months later. This schedule proved to be far too ambitious; actually it took four years to complete publication. The \$500,000 appropriation ran out at the end of six months, and the publisher had to assume all remaining editorial costs. It proved to be a complex and difficult project, but in the end the series was a brilliant contribution to the literature of science and technology.

The story also had a happy financial ending for everyone concerned—including the US taxpayer. The publisher invested about \$700,000 in editorial and production costs, which took the place of a large investment by the Government. In addition, by the end of ten years the publisher had paid the Government royalties of \$270,000; while the estimated Federal income tax on the profits from the series came to about \$125,000. Thus was generated a total of almost \$400,000 of direct revenue to the Government.

To most observers the publication of the *Radiation Laboratory Series* was a model of beneficial collaboration between the Government and private enterprise. But, again, there were those who strongly felt that it was really a legally questionable grab of public property by private interests.

Often, such critics naïvely fail to distinguish between publishing and printing. The chief contribution of a commercial publishing house is the know-how of its staff—the editors, art directors, production managers, promotion managers, and salesmen. These people are experts who shape ideas and raw manuscript into sophisticated books, who advertise and sell them vigorously throughout the world. The publisher is a professional who invests his experience and facilities to produce a book, and risks his capital to print and sell it. He usually makes a substantial contribution to the quality of the final product. Further, he not only puts the published book in all available trade channels but also sees that it is properly placed for notice and review in the literature of its subject. These are the reasons why commercial publication enhances the basic purpose of publishing—the widest possible dissemination of a new work among all interested readers in the world. And these are, of course, the reasons why so many authors of Government-financed scientific and technical works prefer commercial publication over GPO printing.

In passing, it seems proper to note another naïve failure of the advocates of public-domain status for all Government-financed works. This is their failure to realize that, in most cases, what everyone *can* publish, no one actually *will* publish. This is especially so of a scientific or technical work of specialized interest. For such a work its limited market will support only one edition. Two editions by different publishers would be profitless for both, and three or four editions would be ruinous for everyone. Once in a blue moon a Warren Commission Report will come along and four or five commercial firms will reprint it, each adding its own distinctive (and copyrightable) notes and interpretations. But for every such report, there are produced for Federal agencies 200 to 300 works of which only one edition can be published profitably. It is truly a pity that so many people choose to disregard this fact of publishing economics.

But we publishers have demonstrated that we, too, can overlook important matters. For only recently has the book industry as a whole become concerned over the question of copyright in Government-sponsored works. Now suddenly this concern has mounted to a feeling near alarm. In the last five years, the Federal expenditure on scientific and technical information grew from about \$70 million to \$223 million. Some publishers fear the Government may eventually preempt large and important areas of scientific and technical information,

and thereby severely damage the private-sector technical information industry.

One serious concern involves the large, mechanized information systems, which the Government will surely spend millions of dollars to develop in the next decade. It now seems probable that Federally-financed information centers will widely replace conventional information media, including several kinds of technical and reference books. One does not have to be especially bright to foresee how this can devastate important areas of commercial publishing. This threat is not remote—to many of us it seems to be just around the corner.

A good example of this particular complex of Government-related problems is the newly projected computer-based Chemical Information System that is being developed by the Chemical Abstracts Service under Government grants to the American Chemical Society. ACS officials estimate that it will cost more than \$40 million to make the proposed system fully operative. The research and development phases, costing about \$15 million, will be financed by three Federal agencies. After that, the start-up operational costs of \$25 million will presumably be financed by the sale of services and publications produced by the system.

This completely mechanized system will produce computer files of the names and structures of compounds, their physical properties, biochemical properties, and so on. If successfully developed, it is sure to give the Chemical Abstracts Service a virtual monopoly of basic chemical information, including print-outs of handbooks of scientific data and technical practice. These will be constantly updated volumes which will replace similar works in chemistry and chemical engineering that are now produced by commercial publishers. In effect, this Government activity may put an entire discipline of scientific information into the hands of a nonprofit publishing monopoly.

But the prospects for the new chemical information system may not be so bright, even to a nonprofit organization, if copyright of the products of the system is prohibited by the new law. If its printed products can be copied by anyone and everyone, and if its computer tapes can be freely used in any manner, then the Chemical Abstracts Service will not be able to obtain sufficient revenue to support operational costs. In short, the system's economic viability will be destroyed. In which case—if the system is to survive—the US taxpayers will have to support indefinitely a project that certainly could and should be self-supporting beyond the initial research and development stage. And what can happen here can happen in many other discipline areas where only Federal "seed money" should be required to establish comparable information systems.

So much for the copyright problems facing technical publishers. The vagaries of copyrights in Government-sponsored works also pose bewildering difficulties for textbook houses. Faced with the problems that emerged from Federally-financed curriculum reform programs in school science, textbook publishers were so stunned that they blinked and ran one way, then blinked again and ran the other, reversing their field and ending up taking a stand that seemed exactly opposite from that of the technical publishers. All this was so confusing as to justify a rueful remark that publishers appeared to be making a two-faced

approach to a two-sided problem. But actually there was good reason for the textbook publishers' perplexed behavior.

In the 1950's, when the first curriculum-reform programs began to produce new textbooks in science, many textbook publishers urged that these should be published by commercial firms under competitive bidding. This was agreed to, but not without some argument, by officials in the Government agencies that supplied the money, and by the nonprofit organizations that contracted to fashion the courses and prepare manuscripts. Several high school texts were published by commercial houses that came forward with low bids and high persuasion. In each case, either the contractor or the publisher was allowed to secure a private copyright. For a while everyone concerned seemed to be reasonably happy with this arrangement. The publishers were particularly pleased that the Government agencies had chosen to cooperate, rather than compete, with existing textbook houses.

But several of the textbooks became thundering bestsellers, and the unsuccessful bidders began to panic. They had not foreseen that, regardless of comparative merit, the Government-sponsored texts received publicity and immediate prestige, plus much priceless promotion through Government-financed symposia, workshops, and summer courses for teachers—all devastating to competitors. As a result, many textbook publishers reversed their stand and demanded that Government agencies henceforth place in the public domain all new courses and instructional materials produced with Federal funds.

The US Office of Education, either irked or not fully understanding the consequences, responded by declaring an official policy under which *all* publications of whatever kind produced under USOE grants or contracts would henceforth be in the public domain. Two other Federal agencies immediately followed suit, specifying that their policy also covered research reports and other scientific and technical works. Naturally this sent the technical publishers hot-footing to Washington crying, "No, no! Our colleagues meant only textbooks!" Confusion followed, both in Washington and, indeed, within the book industry itself.

Though the static within the industry keeps the signal from coming through clearly, publishers who see the problem as a whole are now seeking a flexible middle way: a policy that would allow each Federal agency to decide for or against private publication as each case arises under a grant or contract.

The US Copyright Office also prefers this middle course. In his report to Congress on the new copyright bill last May, Mr. Kaminstein stated, "Under the definition in section 105b (United States Government works) there would be nothing to prohibit an independent contractor or grantee from securing copyright in works prepared by him under a Government contract or grant, as long as the contract or grant permits it. We believe that it is important to preserve the basic right of private authors to secure copyright in these situations, and that any cases in which it is considered desirable to deny or limit protection should be dealt with by agency regulations or contract provisions, or by separate legislation."

The book industry's joint copyright committee has endorsed this viewpoint; in fact, many publishers would like to see it written into

the new law. But the Register, perhaps rightly, deems this unnecessary. In any case, the eventual legislative report on the bill should make this position clear, to ensure that courts will know the intent of Congress when they have later to interpret this section.

Most publishers also accept the Copyright Office's position on the writings of a Government official or employee, but would prefer a narrower definition of an official work. Referring to his definition of Government works in the new bill, Mr. Kaminstein said. "A Government official or employee would not be prohibited from obtaining copyright protection for any work he produces in his private capacity *outside the scope* of his official duties" (italics mine). Publishers would prefer the wording of the 1964 draft of the new Act; as noted earlier, that draft used the words "*as part* of his official duties."

Our objection, of course, is to the word "scope." By both definition and connotation it has a primary meaning of range and expansion, not of limitation and compass. It leaves more room for controversy in any effort to decide the limits of the public employment of, say, an Admiral Rickover or a J. Edgar Hoover. This little word can spell a lot of uncertainty and trouble in the future. Would it not be wise to eliminate it now? A half-century may pass before there is another chance.

COPYRIGHT OR PUBLIC DOMAIN?

A BOOK PUBLISHER'S VIEW OF A QUESTION OF PUBLIC POLICY

(By Curtis G. Benjamin, Chairman of the Board, McGraw-Hill Book Company)

This statement represents the view and the position of the McGraw-Hill Book Company on the troublesome question of allowing private copyright of works financed either wholly or in part, either directly or indirectly, by Federal funds. It is presented in response to a statement of policy announced by the U.S. Office of Education in the *Federal Register*, July 28, 1965:

Material produced as a result of any research activity undertaken with any financial assistance through contract with or project grant from the Office of Education will be placed in the public domain. Materials so released will be available to conventional outlets of the private sector for their use.

We recognize that this fiat in its purpose and rationale is directed to the desirable objective of obtaining the maximum public benefit from expenditures of public funds. We believe, however, that it fails an understanding of either the practical economics of publishing or the urges and satisfactions of creative authorship. It is, we believe, mistaken in its assumption that several firms *will* publish what any firm *can* publish and that thus more and cheaper books will be provided for all. By opening the way to unauthorized changes in non-copyrighted versions, it unwisely discounts the unspoken pride of top-flight authors and their devotion to the integrity of their works. And finally, it mistakenly assumes that one flat and arbitrary rule can be applied beneficially to a wide variety of publications produced under dissimilar circumstances.

Feeling that this USOE policy is needlessly absolute and restrictive and that its observance will be hurtful to governmental, public, and publishing interests, we respectfully suggest that it be carefully reconsidered. At the same time we implore other Federal departments and agencies to take a broad and flexible view of the matter, with due regard for precedents and practices under which hundreds of Government-financed works have been commercially published with benefit to every one involved.

Our statement and plea reflect many years of experience in publishing a large number of Government-sponsored publications. Our list of such publications in its size and variety attests the width and depth of this experience. It also suggests a record of continuing success and of continuing satisfaction to the many Government departments and agencies with whom we have worked. In view of our extensive experience—certainly the widest in the industry—we trust that our statement represents the broadest and the most balanced and positive view that can be offered by a book publisher.

Although nearly every Government-sponsored publication produced by McGraw-Hill in the past half century has differed in certain respects from all the others, most of them can be classified in one of four major categories. The problems of private copyright, Government property, and the public interest vary somewhat with respect to each category. Hence the complexity of a total consideration of a policy on public domain can be clarified by describing each of the four categories and its particular problems. (Categorized listings of Government-sponsored works published by McGraw-Hill and privately copyrighted are appended for the reader's guidance by example.) The four major categories are:

1. Reports of ad hoc commissions, committees, task forces, delegations, symposia, etc.
2. Works written or edited "for hire" (under a Federal contract, grant, or commission), such as histories, treatises, operating manuals, handbooks, compilations, etc.
3. Reports on research done by non-Government personnel under Federal contract or grant.
4. Textbooks and associated instructional materials written by contract or grant.

It is recognized that certain Government agencies (including the USOE) have not in the past been heavily involved in the production of works in every one of these categories; but considering the current expansion of Federal responsibility and activity in educational and informational programs, it is likely that in the next decade scores of commercially publishable works of each kind will be produced in these programs. Thus each category has present importance in the future outlook.

REPORTS OF COMMISSIONS, COMMITTEES, ETC.

Most reports of commissions, committees, etc., are of specialized and transient interest, yet many of them bear their own publishing cost when commercially produced. Most of them are the product of a Government-sponsored commission or committee. The Government pays staff and basic operational costs, but the substance of the reports is produced by private citizens, usually working without pay. (Often Government funds are not provided specifically for publication, and the publisher has assumed the cost of preparing an acceptable manuscript and suitable illustrations.) Hence, it can be said that though these reports are Government-sponsored, the Government usually pays only a part of their total costs, and thus they ought not be considered wholly Government property.

In every instance in our experience, the interests of the Government and the general public have come off well when commercial publication has been arranged:

1. The cost of Government publication has usually been saved.
2. The work has appeared in a better form for having gone through professional editorial hands in the publishing house. (In many cases the publisher has made a literary silk purse from sow's-ears materials.)
3. Dissemination has been wider than it could have been with only a Government Printing Office printing.

4. The work receives more publicity and public recognition, and it is placed more quickly and effectively in the proper channels of literary notice and awareness in its field.

5. The specially interested public has paid no more than a fair market price for the end product.

The argument against placing Government-sponsored reports of this kind in the public domain is simple. A large majority of them are of such specialized interest and such transient value that only one edition can be published with profit. Two editions issued by two publishers would be profitless; three editions would be ruinous. So with every publisher free to publish such a work, no one actually would. Thus there usually must be a GPO printing or nothing. And if a GPO printing is forced, public funds are needlessly spent.

Further, to public participants in a Government-sponsored study, a GPO printing of the resulting report is never as satisfactory as a recognized publisher's imprint. Thus some of the attraction of participation is lost when it is known that only a GPO printing is possible. (GPO publications are infrequently reviewed in newspapers, magazines, and professional journals; often they are not cataloged by libraries in the normal way; often they are allowed to go out of print when a first printing is exhausted.)

Infrequently there is produced a Government-sponsored report that can be published profitably in two or three private editions as well as a GPO printing. The Report of the Warren Commission, which appeared in three commercial editions with added sets of copyrighted background and interpretative materials, is a recent case in point. But for every Government report having such wide public interest, there are produced at least 200 to 300 that can be published profitably in one edition only. In fact, McGraw-Hill has been involved in only two other instances in which commercial editions have been published in addition to GPO printings. One was the report of the Hoover Commission on Government reorganization, of which our company published (at Mr. Hoover's request) a clothbound edition. Sales were just sufficient to produce a break-even point on the venture. The other was an Atomic Energy Commission report entitled *Reactor Shielding Design Manual*, of which our company and another published clothbound editions simultaneously. Sales in neither case were sufficient to produce a profit.

WORKS WRITTEN OR EDITED FOR HIRE

Scores of works are produced each year by professional writers and editors working under a Federal contract or grant or under a fee or salary agreement. In some cases the work is done directly for a Government agency, more often for a contractor or subcontractor. Often the agreement specifies that the writer or editor or contractor can publish and copyright the finished work and receive a fee or royalty for his publishing rights. In such cases, the contractual agreement usually specifies that the Government shall have a royalty-free license to reproduce the published work for its own use.

Commercial publication by contractors of works in this category has been standard practice for many years in several Federal agencies,

including the Department of Defense, the National Science Foundation, and the AEC. The practice is so firmly established in the DOD that standardized contractual clauses are provided in the Armed Services Procurement Regulations. It is so well established in the AEC that six open-end monograph series and many independent textbooks, treatises, and handbooks (totaling well over 100 titles) have been published by contractors and grantees over the past fifteen years. Indeed, the AEC pioneered this kind of commercial publishing when in 1946 it authorized Prof. Henry D. Smyth to write his famous report, *Atomic Energy for Military Purposes*, and to publish it in a copyrighted commercial edition simultaneously with a GPO printing. The report proved to be a great interest internationally, and in spite of a substantially higher price, the commercial edition (published by the Princeton University Press) outsold the other by a wide margin—125,000 to 40,000 copies. The GPO edition, last reprinted in 1950, is now out of print, but the Princeton edition is still in print and in steady demand.

So far as we know, neither the propriety nor the legality of a private copyright secured by explicit agreement under a Government contract or grant has ever been questioned by an official in the executive branch or by a member of the Congressional Joint Committee on Printing, which is responsible for the operations of the GPO.

The advantages to the Government of commercial publication of works in this category are usually the same as those cited for the first category, plus three additional ones that are of some importance:

1. The Government often acquires free copies of the commercial edition for its own use and/or royalty payments that offset a good part of its expense in the venture.
2. The prospect of private income to the author allows the Government to negotiate more favorable terms for the performance of the writing task.
3. The prospect of commercial publication under a recognized imprint attracts writers of higher caliber.

Placing works of this kind in the public domain can ensure printing by the GPO only, with consequent loss of all advantages cited. Indeed, we think it can be safely predicted that many first-class writers and editors will lose interest in producing works for the Government if the requirement of public domain and the prospect of GPO printing are imposed upon them.

REPORTS ON RESEARCH

Many reports produced in fulfillment of Government-financed research projects have been copyrighted and commercially published by contractors or grantees under prearranged terms and conditions. In most of these cases, the right of publication has been an added attraction to the persons or firms undertaking the research projects. The advantages of private publication are the same as those stated for the foregoing category of publication; the disadvantages of public domain are also the same.

It should be further noted that private publication of research reports in no way restricts the fullest possible use of research results as reported.

TEXTBOOKS AND ASSOCIATED INSTRUCTIONAL MATERIALS

Government-sponsored textbooks and instructional materials have publishing characteristics that differ in several respects from those of the first three categories:

1. They must find their place in highly competitive markets. Hence they must be priced competitively yet must bear a heavy freight of promotional and teacher-service costs (sample copies for adoption, desk copies after adoption, teacher's manuals, solution manuals, etc., all usually supplied free).

2. They involve the publisher in larger professional efforts and in higher costs required for editorial perfection and classroom testing. (Here the publisher's contribution goes far beyond the mere editing of a finished manuscript for style and accuracy; it entails assistance with substantive content and structure, and with instructional philosophy and classroom method as well.) Indeed, the publisher's editorial expense may be larger than the Government's contribution to the cost of the finished manuscript. Owing to his high initial cost, the publisher often does no better than break even on the first edition, and in some cases he suffers a loss. Successful second and third editions must be depended upon for realization of profit.

3. A successful textbook is usually the product of an ongoing partnership in which the author has continuing professional and proprietary interests. A textbook manuscript is the product not only of the time and effort required to write it but of the author's total professional training and teaching experience as well. His reputation as a scientist and teacher, and often his experience and reputation as an author of other books, are added ingredients. Thus the author's contribution to a successful text is far more than the actual time and effort required to produce a manuscript. Yet under a Government contract or grant he is usually paid for that time and effort only. So it is that the author often feels (and rightly, we think) that though the manuscript as a physical property belongs to the Government (or to its contracting agency), its style, its methodology, its scholarship, and its authority are still his own. He feels that though the Government has clear legal rights in the manuscript, he still has certain professional and proprietary rights in it. Further he usually feels a deep and continuing concern that the integrity of his work shall not be compromised either before or after publication.

The fact that many authors and contributors to curriculum projects are vitally concerned about this matter is illustrated by the following letter that appeared in a recent (Jan. 21, 1966) issue of *Science*. It expresses the views of an eminent educator who has made significant contributions to the development of Government-sponsored curriculum materials:

The U.S. Office of Education has recently ruled that materials produced by its grantees are not to be copyrighted but are to be placed in the public domain. Although the clear intent of the regulation is to serve the public interest, it appears likely that, in practice, it will have the opposite effect.

What are the probable effects of this new regulation on the future production and dissemination of curriculum materials similar to those, for example, prepared

recently by the secondary school science projects in biology, chemistry, geology and physics, which have been quite widely regarded as of great public value? (I am not concerned here with the effect of the regulation on studies of primarily technical or academic interest). If a USOE grantee were to produce a manuscript for a good chemistry textbook that could not be copyrighted, the reaction of the major textbook publishers would be, I believe, generally negative. An ethical publisher might acknowledge the excellence of the new text and might recognize how satisfactorily it could supplement his line of textbooks. But he would realize that the same materials could also be published by any other publisher, with or without change, and perhaps more rapidly and cheaply. Thus, he might well decide that his necessarily extensive investment in such a book, for careful editing, preparation of illustrations, training of salesmen, a national advertising, and printing and distribution, would place him at a competitive disadvantage with respect to other publishers who might use the same materials with a minimum investment. It appears probable that contemporary public domain materials would be ignored by the more substantial publishers who have full facilities for national distribution, and might even be considered too risky by virtually all publishers.

But there is a more fundamental consideration. Such materials as these do not emerge simply as the result of a grant; they depend also on the creative efforts of scholars and writers. They have an intellectual as well as a fiscal component. Surely the traditional rights of an author should not be summarily discarded simply because his work promises to be of public benefit and has therefore been judged worthy of support from public funds.

The director of a curriculum project supported by the Office of Education may find it difficult to recruit writers who are seriously interested in producing new curriculum materials for our schools, if they are aware of the possible effects of the public domain policy on their efforts. They would realize that their materials might never be published and made available for use in the schools; that their carefully devised themes and logical presentations could be altered at will by editors and publishers; that they might be completely excluded from the opportunity to revise their original ideas on the basis of actual use in the schools.

It seems clear to me that the public domain policy of the Office of Education requires further study. Execution of the policy should be postponed until it is abundantly clear that it is not contrary to the public interest.—ARNOLD B. GROBMAN.

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In consideration of all these factors and attitudes, it seems that in financing a textbook project, the sponsoring Government agency has an obligation to:

1. Recognize the partnership nature of the undertaking and the fact that Government funds support only a portion of the true cost. Private contributions are substantial in every case.
2. Recognize that the perfecting of a textbook usually requires the production of two or three editions and that full value is not returned on the Government's initial "seed money" investment unless revisions are provided for in one way or another.
3. Recognize the author's professional and proprietary interests in the first edition, and provide sufficient incentive for his continued engagement in one or more revisions.
4. Recognize the author's concern for the integrity of his published work, and provide reasonable protection thereof.
5. Recognize that the publisher who makes substantial investments in editorial and promotion expense usually needs to produce at least two editions in order to realize an acceptable profit.
6. Recognize that once a work has been placed in the public domain, there can be no control whatever over the form or manner in which it is henceforth reproduced and used.

Since there has been some misunderstanding in certain Government agencies of the foregoing final point, and since this point is closely

related to the author's concern for the integrity of his published work, it may be well to suggest why this matter is of considerable importance to Government agencies and authors alike.

For example, when a work has been placed in the public domain it can be republished under the author's name with additions, deletions, or revisions made by anyone who chooses to do so, provided that the title page carries a notice as "Revised by John Doe" or "With Additions by John Doe."

For example, the work can be republished under the author's name with the substitutions of a new set of problems, provided that the title page carries a notice such as "With Problems Added by John Doe." Further, John Doe can legitimately put his own copyright notice on such a republished edition.

For example, a printer can produce an offset edition of the original work, reproducing exactly the original indicia (including the publisher's imprint and copyright notice), provided that the title page or cover carry a printed notice "Distributed by John Doe, Printer."

For example, a translated edition can be freely produced by anyone in any language of any foreign country of the world. There can be no effective control of the quality of translations; such control is possible only when a work is protected under one of the international copyright conventions, and this protection is lost when domestic copyright is forfeited. In many foreign countries an inferior translation can be produced and widely sold by a privileged person under the patronage of a ministry of education or a state school system. In other countries, several translated editions can be produced for a market that will support only one. This situation usually results in an initial glut of hastily produced low-quality books but no continuing supply of any kind.

CONCLUSIONS

Since it is inevitable that the Government will sponsor and finance (either wholly or in part) an increasing number and variety of commercially publishable works, and since the problems of copyright and the public interest differ with each publication, it seems unwise for any Federal agency to establish a blanket policy that places all works in the public domain. We are convinced that such a policy is against rather than for the public interest. We think that every agency should have a policy under which qualified officers may decide for or against commercial publication of each separate project or program in terms of Government benefit and the public interest.

It may be reasonable in some cases to require the commercial publisher to abandon his copyright and place a Government-sponsored work in the public domain, but this should be done only after:

1. The publisher has had time to make sufficient sales to realize a reasonable profit in terms of his investment, his risk, and his contribution to editorial quality.
2. The author has had time to realize an adequate return from royalty in cases where anticipated royalty is a consideration in his total compensation for work performed and for knowledge contributed to the job.
3. The owner of the private copyright has allowed the work to go out of print.

Several considerations should enter into a determination of the time span allowed for each copyright agreement:

1. The potential market, the price, the manufacturing cost, the publisher's editorial and sales costs, the rate of royalty paid the author and/or the Government, and the prime life span of the subject content of the book. From five to fifteen or twenty years should be appropriate for works that will not be revised.

2. The time span needed (a) to establish a text as a teaching tool and an educational influence to the satisfaction of the author and to a proper fulfillment of the Government's objectives, (b) to provide the publisher and the author sufficient incentives to perfect and establish a text through the production of two or three editions, and (c) to prevent undesirable exploitation of new texts through revised or disguised editions produced under the author's name and the publisher's imprint. Usually two editions of a college text and three editions of a text for elementary or high schools, with a minimal period of ten years in either case, would be needed to meet this requirement.

For each new publishing project, all these considerations should be subject to negotiation between the responsible Government agency, its contracting agent (if any), and the authors and the interested publishers.

GOVERNMENT-SPONSORED WORKS PUBLISHED BY MCGRAW-HILL AND PRIVATELY COPYRIGHTED

Category 1. Reports of Commissions, Committees, Etc.

Civil Aviation. A report by the Joint Committee on Civil Aviation of the U.S. Department of Commerce and the American Engineering Council. Copyright, American Engineering Council, 1926.

Recent Social Trends in the United States. 2 volumes and 13 specialized monographs. Copyright, President's Research Committee on Social Trends, 1933.

Recent Economic Changes in the United States. 2 volumes. Copyright, President's Conference on Unemployment, 1930.

Air Pollution. Proceedings of the United States Technical Conference on Air Pollution. Louis C. McCabe (Ed.), U.S. Bureau of Mines. Sponsored by the Interdepartmental Committee on Air Pollution, U.S. Department of the Interior, Bureau of Mines. Copyright, McGraw-Hill, 1952.

Verbal Learning and Verbal Behavior. Charles N. Cofer (Ed.), University of California at Berkeley. Proceedings of a conference sponsored by the Office of Naval Research and New York University in 1959. Copyright, McGraw-Hill, 1961.

Vigilance: A Symposium. Donald N. Buckner and James J. McGrath (Eds.), Human Factors Research, Inc. Office of Naval Research contract. Copyright, McGraw-Hill, 1963.

Verbal Behavior and Learning: Problems and Processes. Charles N. Cofer, and Barbara S. Musgrave (Eds.), Office of Naval Research contract with New York University. Copyright, McGraw-Hill, 1963.

Category 2. Works Written or Edited for Hire

The Papers of Wilbur and Orville Wright. Marvin W. McFarland (Ed.). 2 volumes sponsored by Oberlin College on the Wilbur-Orville Wright Memorial Fund and prepared for the press with notes, appendices, and bibliography by the Aeronautics Division of the Library of Congress. Copyright, McGraw-Hill, 1953.

Tables of Integral Transforms. A. Erdelyi (Ed.), The California Institute of Technology. 2 volumes. Copyright, McGraw-Hill, 1954.

Higher Transcendental Functions. A. Erdelyi (Ed.), The California Institute of Technology. 3 volumes. Copyright, McGraw-Hill, 1955.

- Electronic Components Handbook. K. Henney, C. Walsh, and H. Mileaf. 3 volumes for the Wright Air Development Command. Copyright, McGraw-Hill, 1957-1959.
- English-Russian, Russian-English Electronics Dictionary. U.S. Army Signal Corps Intelligence Agency. Copyright, McGraw-Hill, 1958.
- Mariner: Mission to Venus. Jet Propulsion Laboratory, NASA. Copyright, Jet Propulsion Laboratory, California Institute of Technology, 1963.
- Modern Chinese Technical and General Dictionary. National Science Foundation. 3 volumes. Copyright, McGraw-Hill, 1963. Supplement, 1965.
- Human Engineering Guide to Equipment Design. Clifford T. Morgan et al. (Eds.). Office of Naval Research. Copyright, McGraw-Hill, 1963.
- Exploring the Universe. Louise B. Young (Ed.). American Foundation for Continuing Education. National Science Foundation Research Grant. Copyright, McGraw-Hill, 1963-1964.
- Research, U.S.A.; Nuclear Power, U.S.A.; Radioisotopes and Radiation; and Education and the Atom. U.S. Atomic Energy Commission. Copyright, McGraw-Hill, 1964.
- Twelve Doors to Japan. J. Hall and R. K. Beardsley, U.S. Office of Education, Department of Health, Education, and Welfare. Copyright, McGraw-Hill, 1965.
- Basic Problems in Geotectonics. V. V. Belousov, translated by National Academy of Science and American Geological Institute. Copyright, McGraw-Hill, 1962.
- Educational Media Index. Educational Media Council under a contract from the U.S. Office of Education. Copyright, Educational Media Council, Inc., 1964.
- Air Tables. D. P. Jordan and M. D. Mintz, University of California. Lawrence Radiation Laboratory sponsored by the U.S. Atomic Energy Commission. Copyright, McGraw-Hill, 1965.
- Electrical Insulation: Its Application to Shipboard Electrical Equipment. Graham Lee Moses. Supported by the U.S. Navy Bureau of Ships. Copyright, McGraw-Hill, 1951.

Category 3. Reports on Research

- Radiation Laboratory Series. Radiation Research Laboratory, Massachusetts Institute of Technology. 27 volumes and index volume. Copyright, McGraw-Hill, 1947-1953.
- Very High Frequency Techniques. Herbert J. Reich (Ed.). Radio Research Laboratory Staff, Harvard University. 2 volumes. Copyright, McGraw-Hill, 1947.
- Mathematical Theory of Rocket Flight. J. Barkley Rosser, Robert R. Newton, and George L. Gross of the Allegheny Ballistics Laboratory, George Washington University. Copyright, McGraw-Hill, 1947.
- Techniques of Statistical Analysis. Churchill Eisenhart, Millard W. Hastay, and W. Allen Wallis (Eds.) of the Columbia University Statistical Research Group. Copyright, McGraw-Hill, 1947.
- Sampling Inspection. H. A. Freeman, Milton Friedman, Frederick Mosteller, and W. Allen Wallis (Eds.) of the Columbia University Statistical Research Group. Copyright, 1948.
- National Nuclear Energy Series. Columbia University under contract to the Atomic Energy Commission. About 30 volumes. Copyright, McGraw-Hill, 1948-1955.
- Internal Ballistics of Solid Fuel Rockets. R. N. Wimpers of Industrial Engineers, Inc., California Institute of Technology. Copyright, McGraw-Hill, 1950.
- The Operational Code of the Politburo. Nathan Leites. A Rand Corporation Research Study. Copyright, McGraw-Hill, 1951.
- Air War and Emotional Stress. Irving L. Janis. A Rand Corporation Research Study. Copyright, McGraw-Hill, 1951.
- Mobilizing Resources for War: The Economic Alternatives. Tibor Scitovsky, Edward S. Shaw, and Lorie Tarshis of the Rand Corporation. Copyright, McGraw-Hill, 1951.
- Soviet Attitudes Toward Authority. Margaret Mead. A Rand Corporation Research Study. Copyright, McGraw-Hill, 1952.
- The Organizational Weapon: A study of Bolshevik Strategy and Tactics. Phillip Selznik. A Rand Corporation Research Study. Copyright, McGraw-Hill, 1952.

- Weight-Strength Analysis of Aircraft Structures. F. R. Shanley. A Rand Corporation Research Study. Copyright, McGraw-Hill, 1952.
- Introduction to the Theory of Games. J. C. C. McKinsey of the Rand Corporation. Copyright, McGraw-Hill, 1952.
- The Complete Strategist: A Primer on the Theory of Games of Strategy. John D. Williams of the Rand Corporation. Copyright, McGraw-Hill, 1954; second edition, copyright, Rand, 1965.
- Linear Programming and Economic Analysis. Robert Dorfman, Paul A. Samuelson, and Robert M. Solow. A Rand Corporation Research Study. Copyright, McGraw-Hill, 1958.
- Introduction to Matrix Analysis. Richard Bellman of the Rand Corporation. Copyright, McGraw-Hill, 1960.
- The Theory of Plasma Waves. Thomas H. Stix, Princeton University. Air Force Research Grant. Advanced Physics Monograph Series. Copyright, McGraw-Hill, 1962.
- Frontal Granular Cortex and Behavior. J. M. Warren, Pennsylvania State University; K. Akert, University of Zurich, National Science Foundation Research Grant. Copyright, McGraw-Hill, 1964. (Series in Psych.)
- Creativity. Calvin W. Taylor (Ed.), University of Utah. National Science Foundation Research Grant. Copyright, McGraw-Hill, 1964.
- Constitution of Binary Alloys. Rodney P. Elliott, Illinois Institute of Technical Research. Air Force Research Grant. Copyright, McGraw-Hill, 1965.
- The Logic of Decision. Richard C. Jeffrey, City College, City University of New York. Air Force Research Grant. Copyright, McGraw-Hill, 1965.
- Psychology: A Study of Science, Vol. I—Sensory, Perceptual, and Physiological Formulations. Edited by Sigmund Koch, Duke University. National Science Foundation contract with American Psychological Association. Copyright, McGraw-Hill, 1958.
- Psychology: A Study of Science, Vol. II—General Systematic Formulations, Learning and Special Processes. Edited by Sigmund Koch, Duke University. National Science Foundation contract with American Psychological Association. Copyright, McGraw-Hill, 1958.
- Psychology: A Study of Science, Vol. III—Formulations of the Person and the Social Context. Edited by Sigmund Koch, Duke University. National Science Foundation contract with American Psychological Association. Copyright, McGraw-Hill, 1959.
- Psychology: A Study of Science, Vol. IV—Biologically Oriented Fields: Their Place in Psychology and in Biological Sciences. Edited by Sigmund Koch, Duke University. National Science Foundation contract with American Psychological Association. Copyright, McGraw-Hill, 1962.
- Psychology: A Study of Science, Vol. V—The Process Areas, the Person, and Some Applied Fields: Their Place in Psychology and in Science. Edited by Sigmund Koch, Duke University. National Science Foundation contract with American Psychological Association. Copyright, McGraw-Hill, 1963.
- Psychology: A Study of Science, Vol. VI—Investigation of Man as Socius: Their Place in Psychology and the Social Sciences. Edited by Sigmund Koch, Duke University. National Science Foundation contract with American Psychological Association. Copyright, McGraw-Hill, 1963.
- Psychology: A Study of Science, Vol. VII—Psychology and the Human Agent: A View of Problems in the Enaction of a Science. Edited by Sigmund Koch, Duke University. National Science Foundation contract with American Psychological Association. In Press.

Category 4. Textbooks and Associated Instructional Materials

- Flight Preparation Training Series: U.S. Navy, Training Division, Bureau of Aeronautics. 10 volumes. Copyright, McGraw-Hill, 1943-1945.
- Demonstration and Laboratory Experiences in the Science of Aeronautics: A Guide for Teachers and Students. U.S. Civil Aeronautics Administration and the American Council on Education. Copyright, McGraw-Hill, 1945.
- Teaching Aeronautics in High Schools: A Study of Methods, Principles and Measurements. U.S. Civil Aeronautics Administration and the American Council on Education. Copyright, McGraw-Hill, 1947.
- Sets, Relations, and Functions: A Programmed Unit in Modern Mathematics. Mura McFadden, Wendell I. Smith, and J. William Moore (Eds.), all of Bucknell University. U.S. Office of Education. Copyright, McGraw-Hill, 1963.

- Introduction to Probability: A Programmed Unit in Modern Algebra. Boyd Earl, Wilkes College, Wendell I. Smith, and J. William Moore (Eds.), Bucknell University. U.S. Office of Education. Copyright, McGraw-Hill, 1963.
- Chemical Systems and Investigating Chemical Systems (Laboratory Guide) by The Chemical Bond Approach Project. National Science Foundation. Copyright, Earlham College Press, Inc., 1963-1964.
- The Pluralistic Economy. E. Ginzberg, D. L. Hiestand, and B. G. Reubens, Columbia University. U.S. Department of Labor. Copyright, McGraw-Hill, 1965.
- Principles of Radar. Members of the Staff of the Radar School (operated for the Bureau of Personnel of the United States Navy), Massachusetts Institute of Technology. Copyright, Massachusetts Institute of Technology, 1946.
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- English for Today: Book I—At Home and at School. National Council of Teachers of English. U.S. Information Agency. Copyright, McGraw-Hill, 1962; revised edition 1965.
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COMPUTERS AND COPYRIGHTS¹

RESTRICTIONS ON COMPUTER USE OF COPYRIGHTED MATERIAL WOULD
PROTECT AUTHORS, PUBLISHERS, AND EVEN USERS

(By Curtis G. Benjamin)

In the debate over the proposed new copyright law and its possible impact on the future of computer-based information systems, only two points have thus far emerged clearly and incontrovertibly: (i) new legislation is very badly needed; (ii) the new law, though it should adequately protect the owners of copyrights, must not be so stringent as to restrict the development of computerized information systems, particularly in science and applied science. Nevertheless, the Congress may soon deal decisively with this matter in acting upon the new copyright bill which is now before both houses.

To date there has not been enough debate, either public or private, on the problems and issues involved. It may be useful, therefore, to have an analysis of them by a book publisher, though an admittedly biased interest in the matter may be displayed here. But even a publisher can strive for objectivity in considering certain long-range involvements of the future welfare of science information and hence of science itself.

A basic requirement of the new law is to provide for copyright security in a work first produced by means of, or with the aid of, an automated mechanism such as a computer. This requirement has to be dealt with *de novo* because there is nothing in the present copyright law—enacted in 1909 and not overhauled since—that recognizes this kind of production. The pressing need to satisfy this requirement is suggested in a paragraph in the Annual Report (draft copy) of the Register of Copyrights for the Fiscal Year 1965:

As computer technology develops and becomes more sophisticated, difficult questions of authorship are emerging. In past years the Copyright Office has received an application for registration of a musical composition created by computer. This year copyright was claimed for an abstract drawing, and for compilations of various kinds, which were at least partly the "work" of computers. It is certain that both the number of works proximately produced or written by computers, and the problems of the Copyright Office in this area, will increase. The crucial question appears to be whether the "work" is basically one of human authorship, with the computer merely being an assisting instrument, or whether the traditional elements of "authorship" in the work (literary, artistic, or musical expression or elements of selection, arrangement, etc.) were actually conceived and executed not by man but by a machine.

The crucial question is also a tough one. Though few people will allow that a machine can actually *create* an original literary or scientific work, it must be allowed that a computer when properly programmed can produce a compiled or derivative work that is copyright-

¹ Reprinted from *Science*, Vol. 152, 8 Apr. 1966.

able. In this tangled matter of human authorship versus machine performance, the Copyright Office has taken a liberal view. It has stated that where human direction has guided the computer in producing a work, either proximately or through one or more programs aimed at the result, or where the computer output was edited or arranged by human beings, the mere use of a computer would not of itself prevent copyright registration. (This is a reversal of an earlier decision on the point.) Further, the Copyright Office admits that it would be a rare case indeed where no elements of human authorship whatever can be identified in the preparation of a work.

The reasonable practicality of the Copyright Office's policy under the present law was to be expected because the Register of Copyrights, Abraham L. Kaminstein, made an eminently sensible approach to the general problem of computer storage and retrieval when the 1965 Copyright Bill was introduced last February. Let us go back and review what was then proposed for congressional action and what Kaminstein had to say in support of his draft of the bill.

Starting with a basic definition, Section 102 of the new bill describes subject matter of copyright simply as "original works of authorship" rather than "all the writings of an author," as the present law has it. The new definition is certainly much broader and more flexible. Still it seems not to deal adequately with the crucial question whether a machine or only a human being is capable of "authorship," and probably this question will eventually reach the courts for decision.

Following its new basic definition of subject matter, the bill does deal very effectively with the question of form. Whereas the 1909 Act has an implicit requirement that subject matter be fixed in some tangible form from which the work can be reproduced, the new bill more explicitly specified "fixed in any tangible medium of expression, now known or later developed, from which they [original works] can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device."

Again the new language is about as broad as one could ask, and certainly it is flexible and forward-looking. It leaves no doubt about the copyrightability of works *first produced* and fixed in a computer or any other kind of mechanized system.

So far, so good. The more debatable questions arise with the Register's proposals in Section 106(a) of the new bill, which covers the author's exclusive rights of "reproduction" and of the preparation of "derivative works" from a *previously copyrighted* work. The first two clauses of this section's so-called "bundle of rights" give the owner of a copyright exclusive rights (i) to reproduce the copyrighted work in copies or phonorecords, and (ii) to prepare derivative works based upon the copyrighted work.

Commenting in his Report of 1965 on the background to the wording of these two clauses with respect to information storage and retrieval systems, Kaminstein reviewed earlier thinking on the matter:

An important question that has emerged since publication of the Report in 1961 involves computer uses of copyrighted materials. Mainly in an effort to stimulate a discussion of the issue, the preliminary draft of 1963 contained a provision granting an exclusive right "to reproduce [the work] in any form in the programming or operation of an information storage and retrieval system." We became convinced, however, that it would be a mistake for the statute, in trying

to deal with such a new and evolving field as that of computer technology, to include an explicit provision that could later turn out to be too broad or too narrow. A much better approach, we feel, is to state the general concepts of copyright in language, such as that in Section 106(a), which would be general in terms and broad enough to allow for adjustment to future changes in patterns of reproduction and other uses of authors' works.

After making this background statement, Kaminstein came directly to grips with the basic issues:

At the same time, we should emphasize here that, unless the doctrine of "fair use" is applicable in a particular case, the bill contemplates that certain computer uses would come within the copyright owner's exclusive rights. It seems clear, for example, that the actual copying of entire works (or substantial portions of them) for "input" or storage in a computer would constitute a "reproduction" under clause (1), whatever form the "copies" take: punchcards, punched or magnetic tape, electronic storage units, etc. Similarly, at the "output" end of the process, the "retrieval" or "print-out" of an entire work (or a substantial part of it) in tangible copies would also come under copyright control.

More difficult questions arise with respect to the detailed indexing or abstracting of a work for use in a computer program, and the reference use of the work in the course of the computer's operations. An index or abstract so complete and detailed that it could replace the work on which it is based should probably be regarded as an "abridgment" or "condensation," and hence a "derivative work" covered by Section 106(a)(2). On the other hand we do not believe that the mere use of a work by the computer as a reference source in solving problems or compiling data should be regarded as within the scope of copyright, any more than the use of books in a library is now.

Kaminstein's forthright opinion that the mere input of a copyrighted work into a computerized system would clearly be an infringement under the new law came as a surprise, not to say a shock, to many people. They could not agree that storage could be considered as copying, or even as the making of a "derivative" work. Nor did they understand that the possession of a copy of a work does not give the owner any property rights whatever in the work itself—that the purchaser of a book has indeed bought no more than the right of access to a certain literary or scientific work through the physical form of the particular copy purchased. Such people, confronted by the facts of the law on literary property, usually declare stoutly, "But if I have bought a book, it is mine and I can do what I want with it!"

In actual fact, however, the owner of a store-bought book—or of a free copy, for that matter—cannot do as he wants with it. He cannot copy such portions of it as may be considered "unfair use" by the courts; he cannot translate it into another language; he cannot make from it an abridgment of an adaptation or a derivative version of any kind. And now the proposed new law would keep him from storing its content in a computer without permission of the copyright owner.

It is not surprising that Kaminstein's statement of the intent of the language of the new bill has caused some consternation among computer manufacturers and users, nor that it has served to reassure authors, editors, and publishers of scientific and educational books. Both camps have been on edge, and each has tried, of course, to place its cause in the best possible light. The "hardware" camp has contended that the public interest demands that progress in information-retrieval methods and systems must not be impeded by copyright restrictions on the mere storage of materials in systems intended for scientific and educational use. The "software" camp has argued to the contrary, that the public interest will be ill served if copyright works

are not protected at the point of input, because the lack of such protection will surely destroy incentives for the creation of scientific and education publications for general public use. (Financial reward is only one of the incentives here involved; just as important are professional recognition, pride of authorship, and protection of the form in which a work has been created.) Nevertheless, both sides seem to agree—in principle at least—that the urge for progress in the development of “hardware” should not be allowed to kill off the “software” on which many information and educational systems must feed. Both agree, in short, that we should find a way to have our cake and eat it too.

The central question in this critical argument over input is really quite simple. Once, a copyrighted work has been fully stored without permission in a retrieval system, just what concept of “fair use” would apply to its utilization from there on? It would be unreasonable to say that manipulation of materials within the system for analysis or problem solving, for example would be unfair use. (Kaminstein already has suggested that it would not.) Also, in most cases one would be on rather unfirm ground in claiming that video displays of a page or two retrieved now and then would constitute unfair use. Nor could one usually argue that a computer print-out of a few figures or formulas or of small selections of data would contravene the “fair use” doctrine as it has been established by the courts.

Yet the foregoing are exactly the kinds of use that are customarily made of handbooks, data books, and other basic reference works in science and technology. Examples could be given also of similar kinds of seemingly fair use of copyrighted instructional or testing materials once they have been stored in a computerized teaching system established for citywide, statewide, or even nationwide classroom use. Thus it is understandable why authors and publishers of copyrighted educational materials that are subject to such use are also ready to support the concept of protection at the point of input.

The threat to the “software” camp can be best illustrated, perhaps by hypothesizing a situation which could well come into existence a few years hence. Let us suppose that a large corporation—say a Monsanto or a Du Pont—has established a company-wide (and hence a nationwide) computerized technical information system for use at the touch of dozens of consoles by its hundreds of scientists and engineers. Let us also suppose that the “hardware” camp has prevailed in the copyright argument and that the corporation is free to store the whole of Perry's *Chemical Engineers' Handbook* in its computerized system. Let us finally suppose that the corporation buys one copy of this handbook, stores its content, and then puts it to the seemingly “fair” uses described above. Obviously, in a situation such as this the one stored copy could take the place of as many as 500 or even 1,000 copies of the handbook as it is now used. And if eight or ten other large corporations did likewise, there would be no remaining market sufficient to sustain publication. And soon no one would bother with compiling, editing, and printing a work of this sort. What then?

When this question has been put to members of the “hardware” camp, the answer usually has come quickly: “That's easy—the corporation itself will produce the data needed for its system.” This is an

easy answer, certainly, but it provides a rather difficult solution to the problem. To begin with it would be neither efficient nor economical, and hence would be more costly on the national scale. More important, it would more likely restrict than widen dissemination, because once a company had made a large investment in building up a mass of valuable research, design, and operating data, it would hardly be willing to share it with all comers. And, as usual, the little fellow would be the one most hurt. He could not afford to develop a comprehensive data system of his own, yet the springs of presently available copyrighted data would have been dried up.

In the face of these foreseeable difficulties and uncertainties, would it not be wise to proceed with the enactment of the proposed new copyright bill with its provision for the protection of copyrighted works from unauthorized storage? Both camps would have to be prepared to deal with permissions at the storage point, and also with fees in cases in which more than "fair" use is involved. Neither requirement should be onerous. Since storage is a one-time thing, fees could be fixed for annual payment. Further, as the dimensions of possible use could be estimated for each system, the question of setting proper fees or use-rates would not be difficult. (If it were worthwhile to do so, accounting subsystems could be built in to provide exact information on high-volume usage.) Moreover, since haste comes with retrieval rather than with storage, there would usually be ample time to negotiate permissions and fees. In short, there seems to be no practical problem that could not be met without undue effort, expense, or delay.

What else can be said and done?

Well, it can be said that both camps should make every effort to be flexible and originative in helping to meet the imperative national need for the development of large-scale computerized systems. The authors and publishers must frankly face the fact that their copyrighted materials must be made available to such systems, and on reasonable terms and conditions. "Hardware" manufacturers and systems developers must realize that neither their particular interest nor the general public interest is so important as to justify a demand for public expropriation of private literary property, either legally or otherwise.

Above all, authors and publishers must not be obstructionists in carrying out their obligations to protect their conventionally printed products. To the contrary, they should actively seek ways to promote the use of their materials in mechanized systems—making sure, of course, that they receive adequate fees to compensate for the consequent loss of sales of printed copies.

Why should publishers not vend many of their products in both magnetic-tape and printed form? Probably they should, but if they do, they must be careful not to accept licensing practices that might trap their authors and themselves in another "juke-box exemption" situation a few years hence—which is to say that they must not accept a licensing practice under which the copyright owner receives only a one-payment fee for the right to "record" a work on a computer tape which could be used over and over again in any number of informational systems without additional payments.

Above all, the "hardware" manufacturers and systems operators must be careful that their demands and practices do not hurt the generation and flow of copyrighted scientific and technical information. They must avoid demands that might cause a sacrifice of human creativity to the convenience of their machines. And they must realize that assaults on copyright protection of literary property in the name of overriding public interest can only invite similar assaults on patent protection of their machines and industrial processes.

When these accommodations in thinking and attitudes have been made on both sides, practical business solutions to the remaining problems must be sought and found. This may not be easy, but certainly it can be done, and done with fairness to all interests. "Be there a will, and wisdom finds a way."

APPENDIX C

COMMUNICATIONS

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FEDERAL

THE SECRETARY OF COMMERCE,
Washington, D.C., June 2, 1966.

HON. JOHN W. McCORMACK,
Speaker of the House of Representatives,
Washington, D.C.

DEAR MR. SPEAKER: There are enclosed herewith four copies of a draft bill to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data, and four copies each of a statement of purpose and need in support thereof, and a section-by-section analysis.

The Bureau of the Budget advises that enactment of this legislation would be consistent with the Administration's objectives.

Sincerely yours,

JOHN T. CONNOR,
Secretary of Commerce.

STATEMENT OF PURPOSE AND NEED THE STANDARD REFERENCE DATA ACT

BACKGROUND

The Federal Council for Science and Technology announced in 1963 a policy that there should be established a National Standard Reference Data System to provide on a national basis critically evaluated data in the physical sciences. The Department of Commerce, through the National Bureau of Standards, established a program to assist in furthering this policy. The basic objective of that action was to make critically evaluated qualitative data on the properties of substances readily available to Federal technical agencies and this country's scientists and engineers.

The proposed legislation is needed in order to provide the legal framework for a program to produce compilations of critically evaluated data on the properties of substances and their interactions, gathered from research reports throughout the world, evaluated by experts, and disseminated to the technical community. Through this legislation the voluntary and cooperative activities of all those concerned with the reference data program could be fitted into a coherent and comprehensive pattern so as to assure maximum benefit to the entire governmental and non-governmental community. The bill would also authorize the use of a symbol or mark in connection with the term "Standard Reference Data" so that the products of this interagency program can be identified and relied upon by the scientific, engineering and industrial communities.

Compilations carried out other than by the National Bureau of Standards may become a part of the Standard Reference Data System through the voluntary efforts of the agencies and if they meet the standards prescribed by the Secretary of Commerce through the National Bureau of Standards. Through this voluntary cooperative arrangement and the activities of the National Bureau of Standards, it will be possible to provide to the technical community critically evaluated data which will lead to substantial savings in time, effort and money.

NEED FOR STANDARD REFERENCE DATA

The significance of the Standard Reference Data operation can best be understood by a look at the process by which measurements of the properties of substances are made available to scientists and engineers. Property measurements are produced as a result of the research done by millions of scientists and engineers all over the world. The data are published in various scientific journals, reports, handbooks, and so forth. Therefore, while these data are available to anyone who is prepared to search the literature to find them, it is quite often difficult to locate a specific number or value in the millions of pages of scientific

literature. Of equal importance is the fact that once the number or value is located, it is difficult to determine just how reliable such information is. A complicating factor is that often more than one researcher works in the same field, each developing his own number or value for the same property. Only a specialist in the field can tell which is most likely to be correct. Accordingly, the Standard Reference Data System has as its purpose three main functions:

1. Extract the necessary data from the literature;
2. Determine the data's accuracy and reliability through a process of critical evaluation; and
3. Make the evaluated data readily available to users.

The data are called "reference" because scientists and engineers repeatedly refer to the data in their work. They are called "standard" because differing values are critically evaluated by the most competent scientists in the field who then select and certify a single value or range of values as the best or "standard" one. The data may then be used with maximum confidence, for rather than having to make independent measurements of physical and chemical characteristics of materials, scientists and engineers would be able to refer to the Standard Reference Data and depend upon the reliability of the measurements which have already been made and critically evaluated.

TECHNICAL SCOPE OF THE STANDARD REFERENCE DATA SYSTEM

The products of the system are compilations of critically evaluated data on the properties of substances, critical reviews of the state of knowledge of the measurable properties of substances, and computations of useful functions derived from properties of substances.

The technical scope of the system embraces only physical and chemical properties and their interactions. Only substances of well-defined composition and structure are considered appropriate, and only intrinsic properties of the substances or systems under consideration are to be included.

These limitations can be described by use of a few examples. The free energy of formation of sodium chloride is a well-defined property of a pure substance of known structure and composition; therefore, numerical data for this property are appropriate. Critically evaluated data of this type are in the compilation entitled "Selected Values of Chemical Thermodynamic Properties" (NBS Circular 500) which is considered to be "Standard Reference Data." The atomic energy levels of the silicon atom similarly are well defined properties of a well defined substance and such data are appropriate. Critically evaluated data of this type are in the series entitled "Selected Values of Atomic Spectra" (NSRDS-NBS-3); this compilation is also considered to be "Standard Reference Data." On the other hand, the thermal conductivity of fire brick is a well defined property of a substance of poorly defined composition and structure. Therefore, such data are not within the scope of the Standard Reference Data System. Similarly, the hardness of tool steel is a poorly defined property of a substance of poorly defined composition and structure. Again such data are not within the scope of the program.

Operational data on components, devices, and other manufactured or assembled systems are well outside the scope of activity for the program, as are maps, navigation charts, weather data, and similar information.

PARTICIPATION IN THE STANDARD REFERENCE DATA SYSTEM

A. National Bureau of Standards

In assuming leadership for planning and operating a coordinated program of reference data compilations to meet the needs of the scientific and technological community, the responsibilities of the National Bureau of Standards would include the establishment of an interagency mechanism with representation from agencies participating in the Standard Reference Data System in order to obtain guidance in the establishment of policies and priorities; determining, in cooperation with others, the needs for Standard Reference Data and compilations; and maintaining a central registry of reference data compilation activities throughout the United States. Other responsibilities would include consulting with appropriate specialists to establish standards and criteria for the various products of the program; managing the data compilation projects funded directly by the National Bureau of Standards and such other projects financially supported by other agencies as may by mutual agreement be placed under the management of

the National Bureau of Standards; monitoring and advising on the performance of the various components of the program in meeting objectives; and developing and operating mechanisms for coordination of data compilation activities throughout the United States. In addition, it would involve the maintenance of a central file of reference data compilations containing the output of data compilation projects and the development and operation of dissemination services designed to ensure that the products of the program are readily available to users.

B. Other Federal agencies

Participation of other Federal agencies in the Standard Reference Data System would be entirely voluntary. It would include participation in the interagency mechanism, which would be established to provide guidance on Standard Reference Data System policies and priorities, and in the planning of a coordinated reference data program; sponsoring reference data activities which are necessary for the effective discharge of their responsibilities and which have a technical scope of interest primarily within the mission of their own agency; cooperating with the National Bureau of Standards in the operation of those reference data activities which support the missions of several agencies and the scientific and technological communities at large; and participation in activities with the National Bureau of Standards which would be designed to determine national needs for compilations of critically evaluated data and to establish technical scope, nature of output, and standards of quality for all data activities within the Standard Reference Data System. Finally, such participation would include ensuring that products of data activities under the sponsorship of such agencies are made adequately available to technical users, either by direct distribution or through the mechanisms of the National Bureau of Standards; and to the extent practical and consistent with immediate mission objectives, endeavoring to meet standards of quality and format established for products of their data activities through the initiative of the National Bureau of Standards.

SECTION-BY-SECTION ANALYSIS OF BILL

Section 1 declares it to be a Congressional policy to make critically evaluated reference data readily available to scientists and engineers.

Section 2 defines various terms that appear in the bill, including that of "Standard Reference Data."

Section 3 of the bill would authorize the Secretary of Commerce to arrange for the collection, compilation, critical evaluation, publication and dissemination of Standard Reference Data. In exercising this authority, the Secretary would be required to utilize the reference data services and facilities of other agencies at the Federal, State and local government levels, with their consent, so as to avoid duplication of the same services and facilities. The section also explicitly states that nothing in the Act is intended to repeal or in any way affect existing authority or responsibility of any Federal Government agency.

Section 4 of the bill would authorize the Secretary, in consultation with other interested Federal agencies, to prescribe and publish in the Federal Register such standards, criteria and procedures for the preparation and publication of Standard Reference Data as may be necessary to carry out the purpose of the Act.

Section 5 of the proposed legislation would authorize the Secretary to publish and sell Standard Reference Data, produced entirely at Government expense, at prices which would reflect the cost of collection, compilation, evaluation, publication and dissemination of such data, including administrative expenses and would be subject to the Organic Act of the National Bureau of Standards. This would be permitted without regard to any other law under which Government printing is accomplished and sales permitted. This section is consistent with Congressional and executive policy in that it seeks to recover from the special users of the Standard Reference Data the cost of producing the data which is of special benefit to these users.

Section 6 calls upon the Secretary to adopt a symbol or mark which he could use or authorize others to use in connection with the term "Standard Reference Data." The symbol or mark would be published in the Federal Register.

Section 7 of the bill lists specific acts which are prohibited. These acts pertain to use of the Standard Reference Data symbol or mark adopted by the Secretary, without first receiving his written authorization to do so, or that of his designee.

Section 8 declares that whoever commits any of the prohibited acts listed under section 7 shall be subject to a civil penalty of up to \$100. The Secretary would be authorized to compromise the civil penalty.

Section 9 would grant jurisdiction to the United States district courts to enjoin violations of the Act. Upon request of the Secretary of Commerce, the Attorney General may seek injunctions to prevent such violations.

Section 10 of the bill would authorize the appropriation of such amounts as may be needed for the purpose of the Act.

Section 11 sets out the short title of the bill as the Standard Reference Data Act.

THE LIBRARIAN OF CONGRESS,
Washington, D.C., June 22, 1966.

Mr. CHARLES F. DUCANDER,
Executive Director and Chief Counsel,
Committee on Science and Astronautics,
House of Representatives,
Washington, D.C.

DEAR MR. DUCANDER: In response to your request of June 20, 1966, I am pleased to forward my comments on H.R. 15638, a bill to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data.

I support the stated policy of the bill, which is "to make critically evaluated reference data readily available to scientists, engineers, and the general public." However, in carrying out this commendable policy, the bill contains a provision which I believe is in serious conflict with existing law.

Section 7(b) prohibits any person, without written authorization, from copying "any data compilation bearing the Standard Reference Data symbol or mark adopted pursuant to section 6," and section 8(a) provides a civil penalty of up to \$100 for "each copy of a publication which violates any provision of section 7." A copyright is, in essence, the legal recognition of exclusive rights, notably the rights of copying and publication, in works of authorship, including compilations. Thus, sections 7 and 8 of the bill seem intended to create the equivalent of a copyright, but with protection which, unlike the present law, is perpetual in duration and free of the safeguards written into the present law to protect users and the public.

This, of course, raises a number of serious problems. The first stems from Article I, section 8 of the Constitution, which grants Congress the power " . . . to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." Since section 7(b) of the bill in effect grants the equivalent of a copyright for an unlimited period, there is doubt whether the provision is consistent with the Constitutional limitation. Moreover, even if a time limitation were placed on the protection granted by the bill, I would question the justification for granting special exclusive rights in material coming within the subject matter of the copyright statute in a way that is inconsistent with that statute. Title 17 contains a number of provisions, including those dealing with publication, notice, and registration, that have been carefully worked out to govern all copyrightable subject matter, and that seem equally applicable here.

Of particular importance is section 8 of Title 17, which has provided since 1909 that "No copyright shall subsist in . . . any publication of the United States Government . . ." A similar prohibition has existed in the Printing Law since 1895 (44 U.S.C. 58). These provisions reflect a long-standing Congressional policy of permitting "Government publications" (i.e., works written by Government employees as part of their official duties or employment) to be freely copied. Since sections 7 and 8 of H.R. 15638 are directly contradictory of that policy, they raise a significant policy question.

There is now pending in the Congress a bill (H.R. 4347) for the general revision of the present copyright law. Section 105 of that bill would continue the present prohibition against the copyrighting of Government publications. Extensive hearings were held on the bill from May to September, 1965, and a number of Government witnesses, including those representing the Departments of State, Treasury, Commerce, and Health, Education, and Welfare, testified in support of the prohibition. Representatives of the Department of Defense and of the Atomic Energy Commission urged a provision that would permit a Government copyright in special cases and under carefully safeguarded conditions. H.R. 4347 is at present under study by Subcommittee No. 3 of the House Judiciary Committee, which to date has held 34 executive sessions on the bill.

The Copyright Office devoted a good deal of time to exploring the issue of copyright in Government works in the course of the program for general revision of the copyright law. The conclusions reached are embodied in the *Supplemen-*

tary Report of the Register of Copyrights, at page 10. The *Report* found that there were some cases in which copyright in a Government work would do no harm and might benefit the public, but that these rare cases did not warrant setting up the very elaborate procedures required to evaluate them. We believe that, if an exception to the prohibition can be shown to be justified in a particular case, the appropriate method of dealing with it is by specific legislation allowing a copyright under the provisions and requirements of Title 17. An example of this approach is the Act of January 27, 1932 (52 Stat. 6), which appears as an exception to the general prohibition of section 8 of Title 17.

I urge that the Committee consider H.R. 15638 in the light of the problems pointed out in this letter. If it finds that, because of the exceptional nature of the data compilations that are the subject matter of the bill, exclusive rights should be granted to prohibit their unauthorized copying and publication, the bill should be reworded to accomplish this purpose under general copyright principles and the provisions of Title 17, U.S. Code.

Sincerely yours,

JOHN G. LORENZ,
Acting Librarian of Congress.

COMPTROLLER GENERAL OF THE UNITED STATES,
Washington, D.C., June 29, 1966.

HON. GEORGE P. MILLER,
*Chairman, Committee on Science and Astronautics,
House of Representatives.*

DEAR MR. CHAIRMAN: Reference is made to letter dated June 20, 1966, from the Executive Director and Chief Counsel of your Committee requesting our comments on H.R. 15638, a bill to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data.

Our Office has no special information regarding the desirability of the legislation. Consequently, and since it appears that the matter is primarily a question of policy for determination by the Congress, we offer no recommendations concerning the merits of the bill.

Sincerely yours,

FRANK H. WEITZEL,
Assistant Comptroller General of the United States.

NON-FEDERAL

UNIVERSITY OF CALIFORNIA,
LAWRENCE RADIATION LABORATORY,
INORGANIC MATERIALS RESEARCH LABORATORY,
Berkeley, Calif., July 2, 1966.

Representative EMILIO Q. DADDARIO,
*Chairman, Subcommittee on Science, Research and Development, Committee
on Science and Astronautics, House of Representatives, Washington, D.C.*

DEAR SIR: I am happy to have the opportunity to submit my comments on H.R. 15638 to your committee. The rate of growth of our science and technology depends strongly upon the availability of information. In recognition of the importance of wide dissemination of scientific data, considerable expenditures have been made by various government agencies and industrial firms for data compilations. Unfortunately a considerable portion of these expenditures has been wasted as many of these compilations have not been critically evaluated and have been less than worthless in that they have misled and confused scientists and engineers who have attempted to apply these compilations.

The difficulty arises from the fact that scientific data are pouring out of thousands of laboratories all over the world. They are produced in a variety of equipment and by many different methods of varying reliability. They are reported in many different journals and in a variety of units and formats. It is difficult for scientists and engineers who have not specialized in the types of experiments reported to evaluate the reliabilities of the various reported data and to convert them to compatible and consistent bases of comparison. It is of great importance in the application of technical data to insure that the data from a variety of sources have been evaluated and transformed to a consistent basis. Otherwise serious discrepancies will be introduced that can invalidate the conclusions drawn from the information.

The critically evaluated compilation "Selected Values of Chemical Thermodynamic Properties" (National Bureau of Standards Circular 500) is an example of the type of compilation that presents consistent data that can be used by scientists and engineers in all fields. This compilation has been widely used for many applications. It is of greatest importance that compilations of this type be expanded in scope to include other types of data and that they be carried out on a continuing basis to digest the flood of new data and convert them to a consistent critically evaluated form which can be used with confidence in all areas of our technology.

It takes a great deal of careful work by highly trained scientists to produce critically evaluated compilations such as NBS Circular 500. The effort is small compared to the total effort required on the part of many individuals who must prepare their own compilations when they are not available. In those areas where critically evaluated compilations are not available, engineers and scientists often do without the use of available information to the detriment of their work, or, because of their lack of experience with the particular methods used to obtain the data, they may improperly evaluate the data and draw erroneous conclusions which can handicap them in the development of their work.

The effort required to cope with the tremendous outpouring of information is a larger one than could be managed by any government agency or the combined efforts of all the agencies. It is an important feature of H.R. 15638 that the Secretary of Commerce is directed to utilize not only the reference data services of the various governmental agencies but any other compiling activities that meet the standards of the Standard Reference Data Program also are to be coordinated to insure consistency and to avoid duplication. There are many individuals who evaluate and compile the data pertaining to their narrow speciality. The Standard Reference Data Act provides the

means of making the results of these expert evaluations available to all scientists and engineers in a form that is consistent with the rest of the data compiled under the Standard Reference Data Program. These activities can often be added to the Standard Reference Data Program with no expenditures on the part of the Department of Commerce.

In summary, the Standard Reference Data Program that is set up under H.R. 15638 is of the greatest importance to our technology in eliminating wasteful duplication of compilations and ineffective non-critically evaluated compilations. The availability of reliable information will be an important stimulant to our technology.

Respectfully yours,

LEO BREWER,

Head, Inorganic Materials Research Laboratory.

HERCULES POWDER CO, INC.,
RESEARCH DEPARTMENT,
Wilmington, Del., July 7, 1966.

HON. EMILIO Q. DADDARIO,
*Chairman, Subcommittee on Science, Research and Development, Committee
on Science and Astronautics, House of Representatives, Washington, D.C.*

DEAR SIR: In response to your letter of June 20, 1966, I appreciate the opportunity to offer my comments on HR 15638, known as the Standard Reference Data Act, an Administration bill introduced on June 13 by Chairman George P. Miller. I have been quite familiar, for several years, with the planning activities of the National Bureau of Standards, Department of Commerce, on the National Standard Reference Data System (NSRDS). In fact, I have followed the evolution of the NSRDS through my association with the National Research Council as Chairman of the Division of Chemistry and Chemical Technology for the period of 1962 to 1964. It is within this Division that the Office of Critical Tables was established in 1955 to carry on critical data activities initiated by the National Academy of Sciences over thirty years ago. The magnitude of the task of critical data compilation is such that it calls for government leadership and support. I welcome with enthusiasm the expression of interest by the Congress of the United States in the declaration of policy outlined in Sections I through IV of the proposed Bill and heartily endorse the wording of the Act with reference to these particular sections.

Since the compilation and critical evaluation of Standard Reference Data entails a considerable expense which will tend to increase as scientific activities increase, it seems to me desirable to relate the extent of such work to the needs of the scientists and engineers using the compilations. I know of no better way to ensure that such a relationship continues to exist than by establishing prices to the users which may reflect the cost of such compilation and evaluation. Since the government itself is largely involved in the field of science, it does not follow that the entire cost should be so recovered. I note that in Section V, line 20, the phrase, ". . . To the extent practical and appropriate. . . ." modifies the sentence permitting such cost recovery. In my opinion, the pricing policy should aim at maximum utilization of the Standard Reference Data Compilation.

I am opposed to Section VI on the grounds that it might appear to provide some sort of a guaranty of accuracy or special status to the physical data contained in the compilations. In all cases data are approximations to reality and the accepted values change as scientific methods improve. Thus, the use of such a symbol could be confusing in the course of time.

Since Section VII seems to relate to the special type of copyright, it would seem more appropriate to consider this section in light of the very extensive copyright hearings that have recently been in progress and new copyright legislation now being drawn. Personally, I feel that this Section together with Sections VIII and IX should be deleted from the proposed Act. I do not feel that they are in keeping with the purposes of the other parts of the Act, nor necessary to the proper functioning of the new National Standard Reference Data System.

Although these are my personal opinions, I had an opportunity last week at a meeting of the National Academy of Sciences-National Academy of Engineering's Committee on Scientific and Technical Communication (which I chair), to discuss HR 15638 with my colleagues on the Committee and I found that they are in substantial agreement with the above comments. The Committee, however, did not take any formal action in this connection.

Sincerely yours,

R. W. CAIRNS,
Director of Research.

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EASTERN MICHIGAN UNIVERSITY,
Ypsilanti, Mich., July 25, 1966.

HON. WESTON E. VIVIAN,
House of Representatives,
Washington, D.C.

DEAR CONGRESSMAN VIVIAN: Thank you for your letter calling attention to H.R. 15638, a bill to authorize the Department of Commerce to collect and make available critically evaluated, standardized scientific and technical reference data.

We believe that the proposed expansion of the National Standard Reference Data System is highly desirable. Such a program is indeed essential to the most productive development of research and teaching efforts. We are familiar, of course, with the work of the Center for the Application of Science and Technology at Wayne State University, which uses the NASA tapes, and we infer that data compiled under this authorization might be employed in similar ways.

Sincerely yours,

DONALD F. DRUMMOND,
Acting Dean.

THE UNIVERSITY OF ROCHESTER,
DEPARTMENT OF PHYSICS AND ASTRONOMY,
Rochester, N.Y., June 21, 1966.

HON. BARBER B. CONABLE, JR.,
House of Representatives,
Washington, D.C.

DEAR MR. CONABLE: I am replying to your letter of June 17 in which you ask for comments on H.R. 15638. Several thoughts immediately came to mind.

1. Offhand this does sound like the sort of service which logically might be expected to be offered by an agency of the National Bureau of Standards. In fact specialized programs already exist there; one which I am familiar with is concerned with the evaluation of nuclear data. Perhaps all such efforts, old and new, should be organized under one administration.

2. In spite of the limitations expressed regarding the nature of the material to be evaluated this project could become very large, in fact I suspect that it would have to be quite large to be reasonably effective in finding and evaluating new material, in rejecting old, inferior data, and in providing rapid access to the information.

3. This project seems logically to be connected with the broad problem of information retrieval, which has recently been undergoing serious study by a number of separate groups. This means computer operations on a large scale. I understand that there is a big information retrieval project at the Library of Congress, now working to get the entire L.C. card file into computer language and that this is a continuing long range effort to streamline information retrieval for the whole country. A second project, quite a bit smaller, is one sponsored by the N.I.H. with the participation of the National Institute of Arthritic and Metabolic Diseases and three universities, the University of Rochester (Dr. Joseph Izzo), the University of Minnesota (Dr. Lazerow) and Western Reserve University (Dr. Al Goldwyn). I understand that an automated system developed by them over the past five years is already in service. These are obviously only samples of fairly widespread efforts in information retrieval. You probably know of others.

4. The quality of the data provided will naturally depend on the quality and interest of the people who review the data. Will these be permanent staff people who make the judgments, will specialized committees be established from the scientific community, will opinions of individual outside people be solicited?

5. My overall impression is that such a service could be of great value if it proves after study, to be technically and economically sound.

These are all offhand remarks. I hope that they will prove of some value.

Sincerely yours,

H. W. FULBRIGHT,
Professor of Physics.

THE UNIVERSITY OF ROCHESTER,
NUCLEAR STRUCTURE RESEARCH LABORATORY,
Rochester, N.Y., June 28, 1966.

Mr. E. Q. DADDARIO,
*Chairman, Subcommittee on Science, Research and Development, House of
Representatives, Washington, D.C.*

DEAR MR. DADDARIO: Thank you for your letter of June 20, 1966, asking for comments on H.R. 15638 proposing a National Standard Reference Data System. I am presently serving as chairman of an advisory panel on nuclear data to the Office of Standard Reference Data of the National Bureau of Standards; and I feel very strongly that, at least in the nuclear data field, it is absolutely imperative to very substantially reduce the time between the publication of data in scientific journals and the appearance of the data with some degree of critical evaluation in compilations which are quickly available to people working in the field.

Principally because of the Atomic Energy Commission's interest in the nuclear data field, compilations of such data are said to be more extensive and up to date than in many other scientific fields. If so, the situation in other fields must be appalling. The lack of such compilations inevitably leads to vast duplication of effort because it is often quicker to measure physical properties in which one is interested than to search the literature to find out whether someone else has already done so. It is absolutely clear to me that major efforts must be made at once to correct this situation.

The problems involved are so complex that I can see no hope of solving them short of establishing a permanent Government office whose personnel would be involved full time in such efforts. In my opinion, the National Standard Reference Data System under the Secretary of Commerce provides the proper framework for coordinating and strengthening present data compilation efforts, expanding such activities in areas not presently covered, establishing acceptable standards for such efforts and providing a mechanism for distributing the results to scientists and engineers.

The preliminary planning that has been done by the Office of Standard Reference Data as outlined in the National Bureau of Standards publication NSRDS-NBS 1 seems to me a sensible approach. The project is in its infancy, and I welcome any steps that can be taken to get things moving. H.R. 15638 will give Congressional backing to the NBS program and clearly such backing is essential. I can say without reservation that I am very much in favor of passage of this bill by Congress.

Yours sincerely,

H. E. GOVE,
Director and Professor of Physics.

E. I. DU PONT DE NEMOURS & Co., INC.,
Wilmington, Del., June 27, 1966.

Mr. EMILIO Q. DADDARIO,
*Chairman, Subcommittee on Science, Research and Development, Committee on
Science and Astronautics, Rayburn House Office Building, Washington, D.C.*

DEAR MR. DADDARIO: I have reviewed your letter of June 20th with enclosures, which relate to H.R. 15638, a bill to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data.

I would support this proposal enthusiastically, and hope very much that the Bill will have the approval of the Congress. The compilation of recent data is exceedingly important to the entire scientific community, and I can think of no better agency than the National Bureau of Standards to carry that responsibility.

In my very early days as a scientist, I did a small amount of work in connection with the compilation of the International Critical Tables. These have long since become out of date, and I am afraid the task of up-dating is far too great for a private institution to undertake.

As to details, the Bill seems entirely adequate for its purposes and I would have no comments to make as to procedural methods.

Sincerely yours,

C. H. GREENEWALT, *Chairman.*

MELLON INSTITUTE,
Pittsburgh, Pa., June 27, 1966.

HON. EMILIO Q. DADDARIO,
*Chairman, Subcommittee on Science, Research and Development,
House of Representatives,
Washington, D.C.*

DEAR MR. DADDARIO: On the basis of my understanding of the purpose of H.R. 15638, I am in favor of this bill. It seems to me that it will serve as the instrument enabling the Office of Standard Reference Data to proceed with its program in the most effective manner.

Sincerely yours,

PAUL C. CROSS, *President.*

AMERICAN PETROLEUM INSTITUTE,
New York, N.Y., July 27, 1966.

Mr. PHILIP B. YEAGER,
Counsel, Committee on Science and Astronautics,
House of Representatives,
Washington, D.C.

DEAR MR. YEAGER: Thank you for your letter of July 5, 1966 inviting the American Petroleum Institute to comment on H.R. 15638. After consultation with industry and staff representatives we have concentrated our comments on two points.

Our first comment is with regard to Sec. 4 which requires the Secretary to consult with other interested Federal agencies before prescribing and publishing the standards, criteria, and procedures for the preparation and publication of Standard Reference Data. We believe this consultation should be expanded to include representatives of the State and local governments, persons, firms, institutions, and associations which are covered in Sec. 3. Our experience has shown that the best design of Standard Reference Data is performed by the prospective users and not by the compilers alone. The advice of those who will be utilizing the output of this program is necessary in order to insure greater acceptability.

Our second comment is an objection to Sec. 7(b). We believe that this section violates the intent of the proposed act. The first section states that it is the policy of the Congress to make reference data readily available. However, Sec. 7(b) which requires written authorization prior to copying any data compilation is antithetical to the concept of making the data available for general use. We endorse the free exchange of standard data and can see no reason to restrain the use of the information by requiring an authorization prior to making a copy of any data compilation. We suggest that Sec. 7(b) be deleted.

Thank you again for the opportunity to comment on this bill.

Sincerely,

FRANK N. IKARD, *President.*

THE UNIVERSITY OF MICHIGAN,
SCHOOL OF DENTISTRY,
Ann Arbor, July 7, 1966.

HON. WESTON E. VIVIAN,
House of Representatives,
Washington, D.C.

DEAR MR. VIVIAN : Thank you for sending an analysis and copy of H.R. 15638. Your good distribution of the bill should bring some meaningful response on the merits or weaknesses of the bill.

From a discussion of the measure with some of our staff members at the School of Dentistry, I am able to draw the following conclusions as a consensus of their thinking :

(1) The bill, if enacted, would provide a program of some merit for many people, especially those connected with private industry where an extensive library is not readily available; and

(2) Such a reference system would be somewhat less important to a facility such as the School of Dentistry due to expertness of our professional staff and the current availability of reference data in our own library.

As a general observation of the bill, close attention should be given the proposed program as to the degree of selection that would be made on data taken from the literature. Also, determination of the data's accuracy should be complete enough to make the data useful to all levels of scientific investigation.

Some analysis should be made as to what such reference data might cost an institution such as The University of Michigan where several different schools might be ordering data.

Finally, I would urge that if a Standard Reference Data System becomes a reality, every effort should be made to include data from research and investigation done in private and public facilities in addition to that data gathered from federal agencies.

Again, thank you for giving me the opportunity to comment on H.R. 15638.
Sincerely yours,

WILLIAM R. MANN, *Dean.*

AMERICAN SOCIETY FOR TESTING AND MATERIALS,
Philadelphia, Pa., July 14, 1966.

HON. EMILIO Q. DADDARIO,
Chairman, Subcommittee on Science Research and Development, House of Representatives, Washington, D.C.

DEAR MR. DADDARIO: The chairman and some of the members of our Special Committee on Numerical Reference Data as well as other members of our Society have carefully reviewed HR 15638 which you sent to me for comment. The following are our comments on both the concept of a national data system and the method of carrying out the concept which is proposed in HR 15638.

The scientific and engineering community has great need for readily available and reliable data on the properties of materials, and the American Society for Testing and Materials heartily approves a congressional policy of providing or arranging for the collection, compilation, critical evaluation, publication, and dissemination of Standard Reference Data. There should be a long-range program which receives financial support on a continuing basis.

In our opinion, H.R. 15638 is in general a good implementation of this desirable policy. However, there are two provisions of this bill that should be given serious consideration, because they should be made consistent with policies in much larger fields than that covered by the bill. First, the sections of the bill establishing a trademark for these data publications should be consistent with policies which will be adopted as a result of the investigations which are now in progress by the legislative and judicial branches of the government. Second, the pricing policy proposed in this bill seems businesslike and very desirable, but it should be consistent with pricing policies for all similar publications published by technical, scientific and professional groups and should reflect not only the direct costs of printing and binding but the cost of collection, compilation, evaluation, publication or dissemination of such data, including indirect administrative expenses. This would reduce the cost to government.

We believe every effort should be made to make publication as nearly self supporting as practicable. We believe the important role of government is in stimulating and supporting the collection of such data for the general benefit.

We appreciate your inviting us to comment on this most important bill. If we can be of any further assistance, please do not hesitate to call on us.

Sincerely yours,

T. A. MARSHALL, Jr.,
Executive Secretary.

MOBIL OIL CORP.,
Princeton, N.J., June 30, 1966.

Hon. EMILIO Q. DADDARIO,
House of Representatives,
Washington, D.C.

SIR: Thank you for your letter of June 20, 1966, giving me an opportunity to comment on H.R. 15638, an Administration bill to provide for the collection, compilation, critical evaluation, publication, and sale of Standard Reference Data. I have been familiar with the Standard Reference Data program of the National Bureau of Standards since its inception, and I was convinced of the need for such a program long before it actually developed. It is gratifying to see that the intent of H.R. 15638 clearly is to provide the support and implementation that the Standard Reference Data program has lacked heretofore. Therefore, I am writing, as an individual, in support of that bill.

Numerical data on the physical and chemical properties of substances are among the indispensable tools of the scientist and engineer, whether he be concerned with fundamental research that extends the boundaries of scientific knowledge, with applied research and development of new products and processes, or with design, construction, and operation of commercial plants. However, every practicing scientist and engineer is continually faced with the problems not only of locating needed data in the voluminous technical literature, but also of evaluating the quality of whatever data he may be successful in finding. The Standard Reference Data program of NBS is a well planned approach to solving these problems by providing a mechanism for systematic collection of numerical data now available in the literature, critical evaluation of such data by experts, and wide dissemination of critically evaluated data in a form easy to locate and use. Such a program can be of immense value in all scientific and technological activities within this Nation, and it is clearly appropriate that the Federal Government support and lead this much needed undertaking.

I have no comments of substance on the language and provisions of H.R. 15638 itself. However, I note that the statement of purpose and analysis documents attached to your letter do not stress adequately the importance of participation by nongovernmental organizations, which is provided for in Section 3 of the bill. I am sure that this program cannot be conducted efficiently and economically without the cooperation of the many other organizations that already are interested and active in this field. For example, the American Petroleum Institute Research Project 44 now prepares and publishes tables on "Selected Values of Physical and Thermodynamic Properties of Hydrocarbons and Related Substances," which I consider to be a prime example of "Standard Reference Data." I also suggest that the Subcommittee consider and take recognition of the fact that cooperation with similar undertakings in other countries of the world is both desirable and necessary. I believe that officials of the National Bureau of Standards agree with this point of view about the need for broad national and international cooperation, so perhaps H.R. 15638 should more forcefully endorse such cooperation.

It is a pleasure to recommend favorable consideration of H.R. 15638 by your Subcommittee on Science, Research and Development and by the Committee on Science and Astronautics.

Very truly yours,

JOHN P. McCULLOUGH.

THE UNIVERSITY OF MICHIGAN,
Ann Arbor, Mich., July 11, 1966.

Hon. WESTON E. VIVIAN,
Congress of the United States,
Washington, D.C.

DEAR WES: Thank you for your letters of June 28 and 30, informing me about the hearings on the bill H.R. 15638, which is to provide authorization to the Department of Commerce to collect and make available technical reference data. I found myself not well informed on this subject and I am discussing it with a number of members of our faculty. I gather that the bill has become controversial, even though the desirability of having standard reference data readily available is surely not questioned. In the past, as you know, professional societies have often assumed leadership in providing this service to scientists and engineers. I am sure that I should not ask for an opportunity to appear before the Subcommittee, even if arrangements are made for additional hearings. But if it appears that there is some unanimity in what might be considered a position appropriate to University scientists, I will prepare a statement for the record.

I appreciate your interest in bringing this matter to my attention and to the attention of others in the University and Ann Arbor community.

Yours sincerely,

A. G. NORMAN,
Vice-President for Research.

RICE UNIVERSITY,
Houston, Tex., July 12, 1966.

Congressman EMILIO Q. DADDARIO,
House of Representatives,
Washington, D.C.

DEAR CONGRESSMAN DADDARIO: I am sorry that your letter of June 20 came just as I was leaving for England for a trip on behalf, in part, of the President's Science Advisory Committee. I did not return in time to get a letter in your hands before the July 8 deadline which you specified.

I believe that the collection, compilation, critical evaluation and publication of standard reference data is a very important function, and one in which the National Bureau of Standards should play a very important role. I hope that my failure to present these remarks to you within the time period indicated will not have jeopardized legislation giving appropriate support for this function.

If I can be of any further assistance to you in this connection, please do not hesitate to call on me.

Yours very sincerely,

KENNETH S. PITZER, *President.*

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS,
Washington, D.C., July 15, 1966.

HON. EMILIO Q. DADDARIO,
*Chairman, Subcommittee on Science, Research and Development, Committee
on Science and Astronautics, House of Representatives, Washington, D.C.*

DEAR MR. CHAIRMAN: In accordance with Mr. Miller's letter of July 1st, we are pleased to submit for the record the enclosed statement expressing the views of the National Society of Professional Engineers on H.R. 15638, a bill to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data.

This statement has been prepared after careful analysis of this legislation by our Legislative and Government Affairs Committee, chaired by Donald E. Marlowe, P.E., Dean of the School of Engineering and Architecture at Catholic University.

We feel fortunate indeed in having had Dean Marlowe's counsel and guidance in this matter, particularly in view of his outstanding record of experience and achievement in both academic and government circles.

Sincerely yours,

PAUL H. ROBBINS, P.E.,
Executive Director.

STATEMENT OF THE NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS ON
H.R. 15638

The National Society of Professional Engineers appreciates the opportunity to submit a statement for the record on H.R. 15638, a bill to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data by the Department of Commerce.

We support the concept of a National Standard Reference Data System, and understand that such a system has been established in the National Bureau of Standards since 1963. If, however, after its study of this subject the subcommittee feels that separate legislation authorizing the establishment of this service is required, we heartily endorse enactment of such legislation.

Several aspects of H.R. 15638 do trouble us:

1. We feel that the concept embodied in Sections 6 and 7 of the bill is undesirable. The adoption of a Standard Reference Data symbol by the federal government, and its use as an imprimatur, seems contrary to scientific tradition. The acceptability of technical data depends upon the reputation of the compiler in the technological world, not upon a Government Seal. Activity in this area cannot be equated with grading meat.

2. Traditionally, the cost of obtaining technical data and evaluating it has been kept separate from the cost of publishing it, resulting in the availability of data at relatively low cost. The social gain obtainable from wide dissemination of critical data (standard data) is felt to be sufficient to sustain this principal of operation. The concept of Section 5 of H.R. 15638, which would have "user charges" reflect the total costs of the program, seems undesirable.

3. We have had in this country a long-standing policy of refusing to copyright government publications. The basic principle underlying this policy was reflected quite recently in the "Freedom of Information" bill enacted by the Congress. If, as indicated in Dr. Astin's testimony before the subcommittee, estimated sales under the proposed SRD "copyright" system will only cover a "not large" portion of the costs, such returns do not seem sufficient to justify violation of this long-standing policy.

4. Adoption of government "copyrighting" as contemplated in H.R. 15638 would involve the same thorny questions of dry-copying, computer printout, television transmission, etc., which are now being considered by the Congress

in the proposed revision of the Copyright Act. No such government copyrighting should be initiated until these issues are settled.

In summary, we support any legislative action deemed necessary by the subcommittee to authorize establishment of a National Standard Reference Data System, but feel that those aspects of H.R. 15638 relating to adoption and use of the proposed "Government Seal" are undesirable.

Respectfully submitted.

DONALD E. MARLOWE, P.E.,
Chairman, Legislative and Government Affairs Committee.

THE UNIVERSITY OF TEXAS,
DEPARTMENT OF CHEMISTRY,
Austin, June 23, 1966.

Hon. EMILIO Q. DADDARIO,
Representative from Connecticut, Chairman, Subcommittee on Science, Research and Development, House of Representatives, Washington, D.C.

DEAR SIR: This is in reply to your letter of June 20, 1966, relative to H.R. 15638, an Administration bill to provide for the collection, critical evaluation publication, and sale of standard reference data.

The evaluation of data so as to provide to scientists and engineers the most reliable possible information is a function second only in importance to the performance of research. The vast amount of scientific information now appearing in scientific and technical journals can be understood and assessed by very few people. Experts capable of doing this type of work must be provided with continuing support since theirs is a work of real devotion for which they will never receive much public acclaim.

As scientific data accumulate the value to society of the theoretician who understands the use of modern computers will greatly increase. Since the theoretician is by very nature a person who plays the role of correlator and of innovator rather than of data provider, he must be furnished with data predigested and assessed so that he will not waste more than the minimum necessary time to find the facts so necessary for his work. The first class theoretician is the very rarest kind of scientist and we must do everything we can to provide him with all the help he can profitably use.

For these various reasons I strongly believe that H.R. 15638 deserves the support of the scientific community. I have read the bill carefully and on the whole agree with its provisions. Section 7(b) (page 4 line 14) worries me a little. Modern copying devices have come into such general use that many scientists violate the letter if not the spirit of the copyright law. The making of a lantern slide for a public lecture from copyrighted material is, for example, a violation of the law. *If Standard Reference Data are to be sold at a price which will cover the cost of compilation, the compilations which are sold will go mainly to libraries rather than to individuals.* The copyright laws badly need either revision or reinterpretation but I am sure that your subcommittee would wish Standard Reference Data to be of the widest possible use to scientists. Certainly copying for sale or in such a way as seriously to reduce sales must be prevented but Section 7(b) might mean that a university library could not, for example, make a Xerox copy of a single page for use by a professor or graduate student. I realize that present laws are interpreted to permit such practices but it might be better not to make apparent law breakers out of too many people.

With, perhaps, some attention to this one point I am happy to give very strong support to H.R. 15638.

Very truly yours,

W. ALBERT NOYES, JR.,
Ashbel Smith Professor of Chemistry.

UNIVERSITY OF NOTRE DAME,
COLLEGE OF SCIENCE,
Notre Dame, Ind., July 5, 1966.

HON. EMILIO Q. DADDARIO,
*Chairman, Subcommittee on Science, Research, and Development, Committee
on Science and Astronautics, House of Representatives, Washington, D.C.*

DEAR CONGRESSMAN DADDARIO: In accordance with your letter of June 20, I am transmitting herewith a statement regarding "H.R. 15638, a bill to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data," for science and technology.

With best regards, I am,
Sincerely,

FREDERICK D. ROSSINI,
Dean of the College of Science.

STATEMENT BY FREDERICK D. ROSSINI

I am glad to have the opportunity to present a statement in support of the National Standard Reference Data Program at the National Bureau of Standards. The primary objective of this program is to provide, for the scientific and technical community, reliable numerical scientific information identified as critical tables of standard reference data. Such data make possible the advance of science and industry.

Science depends upon observation and measurement. The better and more accurately we can observe and measure, the better and more rapidly our scientists can develop theories to explain the natural state of things, and the better and more rapidly our technology, and industry can develop products to improve man's existence on earth.

Because of the great expansion in the quantity of numerical data of science in all the scientific periodicals of the world, said to be doubling about every eight years, we have long passed the time when each individual investigator could personally scrutinize the total mass of literature to extract the numerical data relevant to his needs. To make it possible for the scientist to assimilate fully the new knowledge being generated in his field, we interpose between the original literature and the end-using scientist a system of review and appraisal of the scientific information by qualified experts. With such a plan, the numerical data are collected, appraised, and compiled into critical tables of standard reference data. With such standard reference data available, scientists in research laboratories in educational, governmental, and industrial organizations will then have a maximum of time to devote to their main missions, fortified with the knowledge that they have at their disposal essentially all of the existing numerical data in the literature in the form of standard reference data, critically prepared by experts.

With a complete set of critical tables of data available, the number of man-hours of scientific time that could be saved in our laboratories is incalculable. Even more important is the fact that the numerical values so produced would be of much higher quality than can be produced by the sporadic effort of scientists primarily interested in other problems. The quality of the data is very important in the highly competitive technological world of today, where the precise control of temperature and pressure makes possible the conduct of industrial reactions and processes heretofore considered impossible.

In his statement made before this Committee on June 30, 1966, Dr. Frederick Seitz, President of the National Academy of Sciences, reviewed briefly the significant involvement of the National Academy of Sciences-National Research Council in the problem of critical tables of numerical data for science and technology. This involvement began on a large scale with the preparation and publication of the International Critical Tables (1922 to 1933), the work of the Committee on Tables of Constants (about 1940 to 1955), and the work of the Office of Critical

Tables (1955 to the present). The NAS-NRC Office of Critical Tables has made significant progress in surveying the needs for critical tables, coordinating existing projects, providing a directory of compilation projects, and encouraging uniform editorial practices and the use of approved symbols, units, constants, and nomenclature. In addition, the NAS-NRC Office of Critical Tables, operating through the Office of the Foreign Secretary of the National Academy of Sciences, has been successful in developing good liaison with compilation projects in the other major countries of the world. But the establishment of new data-compiling projects for new scientific areas required considerable funding and little progress was made on this objective. In 1963, it appeared that this problem was solved with the establishment of the National Standard Reference Data Program at the National Bureau of Standards, with the expectation of adequate funding.

The true numerical value of a scientific constant is the same the world over. Scientists in all countries have need of the quantitative information of science put together in the form of critical tables of standard reference data. The NAS-NRC Office of Critical Tables, through the Office of the Foreign Secretary of the National Academy of Sciences, has made significant progress in encouraging other countries to become more concerned about this problem on a world-wide basis.

As reported by Dr. Seitz in his testimony before this Committee, the Office of the Foreign Secretary of the National Academy of Sciences has spearheaded the formation, under the International Council for Scientific Unions, of an ICSU Committee on Data for Science and Technology, with "National" members from six major countries (France, Germany, Japan, United Kingdom, U.S.A., and U.S.S.R.) and "Union" members from twelve international scientific unions. Through the operation of this world-wide Committee, it is hoped to have all countries share, in proportion to their capabilities and resources, in the work of compiling critical tables of standard reference data. Our country is looked upon as the leader in this work and must be prepared to support its share of the costs of this international collaboration, by the National Academy of Sciences, operating through its Office of Critical Tables.

In the United States, we recognize three sectors in our scientific and technical community: university, industry, and government. It is important in our free-enterprise system to encourage work on critical tables of standard reference data in all sectors and to achieve the benefits of the competition resulting therefrom. To avoid serious duplication of effort in such work, appropriate coordination must be provided. The National Academy of Sciences, through its operating instrumentality, the National Research Council, has served notably over the years as a place where scientists from universities, industrial laboratories, and government organizations come together for the purpose of exchanging ideas and experiences, and arranging for appropriate coordination of their work in given fields. We hope that industry will continue and expand its support of compilation projects in areas of special interest. A notable example of such projects is the American Petroleum Institute Research Project 44, which has, since 1942, been compiling data on the physical, thermodynamic, and spectral properties of hydrocarbons and related compounds. In the field of standard reference data, the NAS-NRC Office of Critical Tables can provide an arena for needed coordination and for the provision of advisory services.

With regard to the bill being considered by this Committee, H.R. 15638, to provide for the collection, compilation, critical evaluation, publication, and sale of standard reference data, I am in complete and enthusiastic accord with the primary purpose of the bill, to make possible adequate funding of the National Standard Reference Data Program at the National Bureau of Standards.

However, there are some specific comments on several sections of the bill, which I wish to make, as follows:

Section 5. The system for pricing should not prevent the libraries in small colleges and universities, nor the libraries of small research laboratories in industry and government, from having a full complement of standard reference data in some appropriate form. This concern covers not only small libraries in university, industrial, and government organizations in the United States, but also those in all countries in the free world abroad, in many of which dollar currency is not abundant.

Section 6. I approach with considerable hesitation the subject of a "seal of approval" to be placed on each page, chapter, and volume of data under the Na-

tional Standard Reference Data Program. It would seem to me to be adequate to have reports from investigations supported by the National Standard Reference Data Program simply identified as serial publications of NSRDP. We hope that there will continue to be many investigations in this field supported by other than government funds, particularly by industrial associations, which have a big stake in the direction and manner in which such programs are carried on. Among such non-government investigations, there will be many scientists who feel that the quality of their work should be determined not by a governmental or other body affixing a seal of approval but by the process of hard scrutiny and use of the data by their fellow scientists the world over. That is to say, "the proof of the pudding is in the eating".

Section 7. If I understand this correctly, every page, chapter, and volume, regardless of origin, bearing the "seal of approval" of the National Standard Reference Data Program would be copyrighted. As stated by Dr. Seitz in his testimony before this Committee, such action would serve as a deterrent to the free flow of the numerical data of science. It is important that such free flow not be hampered by any artificial restrictions. Natural barriers create enough delay in this process without introducing additional ones.

In summary, I strongly and enthusiastically support the primary purpose of this bill, which is to provide adequate funding for the National Standard Reference Data Program at the National Bureau of Standards, but recommend careful scrutiny of Sections 5, 6, and 7, along the lines indicated above.

BIOGRAPHY OF FREDERICK D. ROSSINI

B.S., M.S., Carnegie Institute of Technology, 1925, 1926. Ph. D., University of California-Berkeley, 1928. National Bureau of Standards, 1928-1950. Carnegie Institute of Technology, 1950-1960. University of Notre Dame, 1960-.

Present position: Dean of the College of Science, University of Notre Dame, Notre Dame, Indiana.

Author or co-author of 8 books and more than 200 papers, including the following books which are relevant to the subject under discussion:

"Thermochemistry of the Chemical Substances." Bichowsky and Rossini. 460 pages. Reinhold Publishing Corporation, New York (1936).

"Selected values of properties of hydrocarbons." Rossini, Pitzer, Taylor, Ebert, Kilpatrick, Beckett, Williams, and Werner. 483 pages. National Bureau of Standards Circular 461. U.S. Government Printing Office, Washington, D.C. (1947).

"Selected values of physical and thermodynamic properties of hydrocarbons and related compounds." Rossini, Pitzer, Arnett, Braun, and Pimentel. 1050 pages. Carnegie Institute of Technology Press, Pittsburgh, Pennsylvania (1953).

"Properties of titanium compounds and related substances." Rossini, Cowie, Ellison, and Browne. 448 pages. U.S. Office of Naval Research, Washington, D.C. (1956).

The following professional connections are relevant:

First Director (1942-1960) of the American Petroleum Institute Research Project 44 on "Data on Hydrocarbons and Related Compounds".

First Director (1955-1960) of the Manufacturing Chemists Association Research Project on "Data on Chemical Compounds".

Current Chairman of the Executive Committee of the Office of Critical Tables, National Academy of Sciences—National Research Council.

Current Chairman of the Committee on Data for Science and Technology of the International Council for Scientific Unions.

SADTLER RESEARCH LABORATORIES, INC.,
Philadelphia, Pa., June 30, 1966.

Congressman GEORGE MILLER,
Chairman, House Committee on Science and Astronautics, House of Representatives,
Washington, D.C.

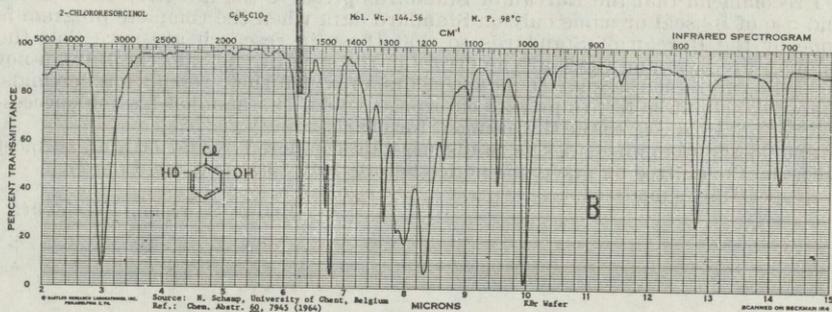
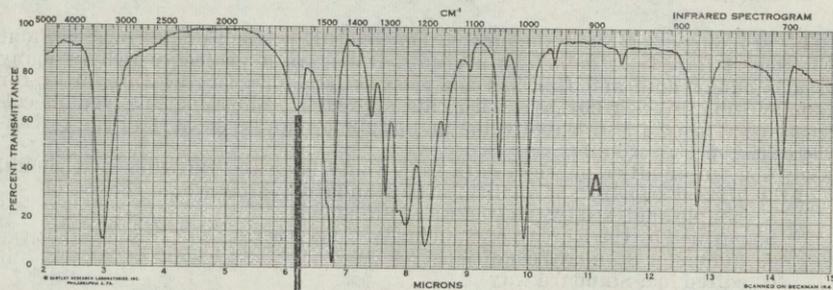
DEAR CONGRESSMAN MILLER: We at Sadtler Research Laboratories have been scanning Infrared, Ultra Violet, and Nuclear Molecular Resonance Spectra since 1947. Based upon this experience, I should like to make the following statement.

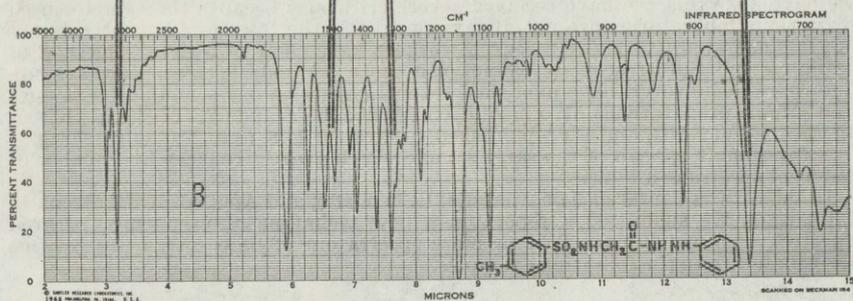
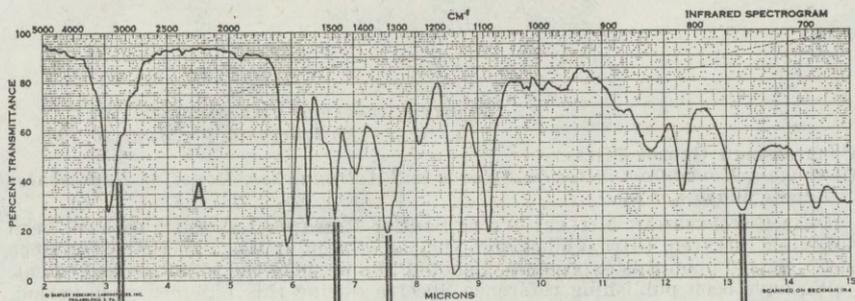
We have been publishing reference Spectra during this nineteen year period. The total number is now over 66,000 spectra. They are used by the leading research laboratories in government, industry and universities in forty-five or more countries. This private enterprise project contains more Standard Reference Spectra than this published by the rest of the world collectively.

The Bureau of Standards is of the opinion that it would be an easy matter to collect other people's spectra and publish them. This is not the case. Whenever we have done this, we have received severe criticisms because the samples used by various laboratories are not always pure, and the Spectrophotometry is not of standard quality. Many research workers have their own unique method of scanning and Spectroscopists cannot use those methods because they are unknown. We, however, have published several papers on our scanning techniques and sample preparations. We have been setting the Standards of the quality of Infrared, UV, NMR, and DTA published spectra for U.S. and foreign research.

Many submit spectra of the same sample which greatly reduces the number of different spectra available.

In 1964 at the Conference on Analytical Chemistry and Applied Spectroscopy in Pittsburgh, we submitted a report on a new technique of preparing Infrared Spectrograms which made 20% or more spectra out of date. This you can see for yourself from the following examples.





The Standard Reference Committee has tended to work on its own without experienced industrial help. As a result, it fosters a project which in many cases is out of date and this has not been satisfactory for the Bureau or for industry committees who have tried this approach. The time involved in collecting spectra of questionable value and duplicity can be more than the rescanning of the spectra would take.

Any spectra or other physical data that would have the Bureau's seal should be of the highest standard of quality. The standard quality would consist of—

- sample analysed by the Bureau of Standards
- purified by the Bureau of Standards, if necessary
- run under Standard conditions
- edited in a Standard way
- printed in a Standard format

Any lesser procedure would not be worthy of the Bureau's seal and could be greatly misleading to research.

I recommend that the Bureau of Standards preserve the integrity of its name and use of its seal or name only on Standard data when the complete program is done by the Bureau of Standards so that those in research are sure that the samples are pure and there are no errors in the spectra. Should the Bureau not be willing to meet these strict requirements, of which their reputation demands, the work should be left to private enterprise which has handled his job successfully at minimal cost to the Government for nearly twenty years.

Should the Committee desire to discuss this further, I would be glad to meet with the Committee on one day's notice before July 15th or after July 24th.

Respectfully submitted.

PHILIP SADTLER, *President.*

AMERICAN GAS ASSOCIATION, INC.,
New York, N.Y., August 8, 1966.

Mr. PHILIP B. YEAGER,
Counsel, Committee on Science and Astronautics,
Rayburn House Office Building,
Washington, D.C.

DEAR MR. YEAGER: This will supplement my letter to you of July 21st.

We have reviewed the Statement of Purpose for the Act, and the Act itself, and we believe that it serves a worthwhile purpose in facilitating a critical evaluation of scientific data. It will be a large task to undertake and accomplish.

One point in the Bill concerns us: Section 7. In this Section 7, standard reference data is virtually made Federal property not to be used without the permission of the Secretary of Commerce. This seems to be an unnecessarily cumbersome device for the protection and identification of the compiled data. The net result would be that the use of the data may be unduly restricted.

Would it be possible for the Secretary of Commerce to develop a symbol or mark which could be used exactly as is a registered trademark? All data which would be taken from the NBS compilation would have to be identified with such symbol or mark but would not require the permission of the Secretary of Commerce. Thus, all data taken from the NBS compilation would be properly identified and the credit inferred therefrom and its accuracy attested to thereby, but the use of the data would be unhindered.

We feel that this is certainly a worthy endeavor.

Cordially,

W. R. SARNO,
Director, Utilization Bureau.

INSTRUMENT SOCIETY OF AMERICA,
Portland, Oreg., July 22, 1966.

MR. PHILIP B. YEAGER,
*Counsel, Committee on Science and Astronautics, House of Representatives,
Washington, D.C.*

DEAR MR. YEAGER: At your invitation, I am pleased to comment on H.R. 15638, a bill to provide for the collection, compilation, critical evaluation, publication and sale of standard reference data.

The objective of the bill to provide for the compilation and positive identification of scientific data which has been validated by a critical review is worthy of full support.

It would appear, however, that paragraph (b) of Section 7 is unduly restrictive in preventing any reproduction of any "data compilation bearing the Standard Reference Data symbol or mark adopted pursuant to section 6 of this Act."

As tables of scientific data are now widely published in college textbooks, technical magazines, scientific papers, manufacturers' literature, technical society journals, and standard scientific reference works not published by the Department of Commerce, the flow of valid technical data could be impeded by a strict enforcement of paragraph (b) of Section 7.

Presumably, the validated data contemplated under the act would be data which would come into general use and the restriction that it could not be reproduced except by written prior authorization of the Secretary of Commerce would place an unnecessary restraint upon the dissemination of technical information.

As this data gathering and validation process would be paid for from tax dollars, and as it has been the custom not to place copyright restrictions on publications so developed in the past, it would appear unwise to make an exception to this broad general policy in this specific case.

On the other hand, the association of the Standard Reference Data symbol with the validated data should be controlled. It appears that this is the purpose of Section 7, paragraph (a). To clarify paragraph (a) of Section 7, the wording should be made more precise, i.e.:

(a) *associate* the Standard Reference Data symbol or mark adopted pursuant to section 6 of this Act with any data compilation provided for in this Act.

Paragraph (b) of Section 7 should then be eliminated entirely.

Very truly yours,

DOUGLAS C. STRAIN,
Director, Measurement Standards Instrumentation Division.

UNIVERSITY OF CALIFORNIA,
LOS ALAMOS SCIENTIFIC LABORATORY,
Los Alamos, N. Mex., June 30, 1966.

HON. EMILIO Q. DADDARIO,
*Chairman, Subcommittee on Science, Research, and Development, Committee
on Science and Astronautics, House of Representatives, Washington, D.C.*

SIR: In response to your request for comments on H.R. 15638 I have the following to say:

The explosive growth of quantitative knowledge in the physical sciences during the past twenty years is revolutionizing technology and thereby all our lives. In some technologies, for instance nuclear reactor design, the demands for evaluated data to be used as input to complex calculations has been so pressing that the quantity and quality of nuclear data has proliferated tremendously beyond what might have occurred under a lesser stimulus. The large volumes of this data and the complex computerized methods of utilizing it have necessitated systematic bibliographic, compilational and evaluational activities to be instituted which have given us a practical foretaste and painful experience in a segment of this problem which can be expected to permeate much of the physical sciences in the forthcoming future.

It is thus timely, if not already somewhat late, to be taking steps on a coordinated national basis which will prepare us for the future utilization of scientific data in a practical and rational way. The Bill H.R. 15638 appears to lay a suitable foundation for this activity.

Many practical problems of great complexity must be overcome and indeed must be continuously worked on to achieve the long-range ends of such a system. It is therefore worthwhile to consider briefly what some of these ends are since unfortunately various expedients will have to be used in the immediate future to get started on the task of catching-up with mountains of data already in existence. It is my belief that in a generation the technological demand for scientific data will be so great both in quantity and rapidity of access that the time-honored system of publication in the printed form will be considered primarily archival. In the past, major users of new scientific data have been the scientists themselves and the conventional publication system was eminently satisfactory, but today even the academic scientists often have urgencies requiring more rapid and complete access to scientific information than through the traditional channels. The future thus clearly points toward computerized methods of data handling in particular for storage, rapid access, rapid revision and insertion and for direct use in many varieties of calculational problems. And thus the need for centralized approaches to a National Reference Data File is easily discernible even including its rather probable future configuration.

The proposal to utilize to the maximum extent those data compilation efforts already existing and to encourage further compilation to be started by experts in the various disciplines is a most desirable starting point. The direction of the National Standard Reference Data System (NSRDS) should however be so oriented that it can exert strong guidance in certain areas. This should be possible because of its central position. For instance, bibliographic work precedes a great deal of present day data compilation; much of this kind of work does not require professional scientists to carry out (although competent scientific direction must exist). At present many different compilations of data in specialized portions of a particular subfield begin with literature searches of precisely the same literature and often by scientists. This wasteful procedure can certainly be rectified to a large extent particularly if centrally guided. Similarly, the problems of converting the data to the appropriate computerized form and the details of the computer systems themselves should be standardized to the greatest extent compatible with the requirements of the system. The Bill and the Plan of Operation of the NSRDS should make it possible for adequate advice to be obtained on such details.

There is, however, one area of scientific data activity in which it is impossible to avoid the detailed attention of those scientists who are expert and specialized in the particular data in question. This area is "evaluation" and lies at the very heart of the requirements of the NSRDS. For instance, the NSRDS has as one of its major outputs data on some physical quantity which it maintains is today's best value with an assigned error as determined by certain expert evaluators in the field. This evaluation function clearly cannot be by-passed for the purposes in mind and is not amenable to computerization since it will usually be derived by painstaking value-judgments to many experimental contributions by an expert in the field. A further example of "evaluation" of a different kind is the supplying of interpolated or extrapolated information where experimental data does not exist; again highly capable scientific experts are essential to provide this information.

It would appear that the basic requirements for a working NSRDS are being set up by H.R. 15638 and by the existing efforts in the field. It should be remembered that this effort must be a continuing one and that full support should be given to it by the scientific, technologic and engineering communities. This will occur only if firm recognition and fiscal support is provided by the Congress not only through the Department of Commerce but also through those other Federal Agencies participating in the system.

Success in the attainment of the objectives of H.R. 15638 will be a major contribution to our nation's eventual technologic strength and position.

Very truly yours,

R. F. TASCHEK,
Physics Division Leader.

THE UNIVERSITY OF MICHIGAN,
Ann Arbor, July 13, 1966.

HON. WESTON E. VIVIAN,
Congress of the United States,
District Office, Ann Arbor, Mich.

DEAR DR. VIVIAN: Thank you for your letter of June 28 and for the information in regards to H.R. 15638. I have read through the bill and the amplifying comments and would submit to you my reactions.

1. There is no doubt a very definite need for such standardization of scientific and technical reference data. I have had occasion in my work to use a number of publications which have been put out by the Bureau of Standards and have found them most helpful. In particular I have used NBS Circular 500, "Selective Values of Chemical Thermodynamic Properties" and have found this a most useful and valuable document. I can, however, think of a number of other areas in which such standardization of data would be most helpful and useful. Therefore, I am basically in support of this bill.

2. It seems to me that it should be firmly established that it will be possible for those writing textbooks, handbooks, etc., to have permission to reproduce reasonable amounts of the data in the appendix of such books. In the two thermodynamic books which I have written, I included a brief summary of certain data which was included in NBS Circular 500 and felt it greatly enhanced the value of the book to the student, and served effectively to introduce the students to such data and by appropriate reference and acknowledgment would lead the student to a basic source of additional data. It would seem to me imperative that provision be made for permission to include summaries of such data in various textbooks and handbooks.

3. I believe it will be immediately evident when such a program is launched, that there is a need for experimental work to provide accurate data which is not at present available. We are currently engaged in measurements of such data and in our Thermodynamics Laboratory in the Department of Mechanical Engineering. Consideration should be given to funding and the means by which these funds can be appropriately distributed to insure that work can be done to provide necessary data which is not now available.

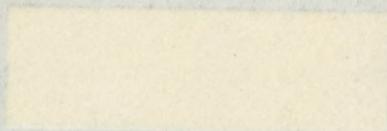
4. It would seem to me that some advisory board, which would include an appropriate balance of representatives from Government, industry, and the University, ought to be established to guide in the formulation of policy by which the intent of this bill will be implemented.

I would be pleased to testify in these matters if it would appear to be desirable. However, I'd be very happy to leave these suggestions with you, and have you handle them as you see fit.

Again many thanks for bringing this to my attention.

Sincerely yours,

GORDON J. VAN WYLEN, *Dean.*





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