

108TH CONGRESS  
1ST SESSION

# S. 682

To authorize funding for Genomes to Life Research and Development at the Department of Energy for fiscal years 2004 through 2008.

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## IN THE SENATE OF THE UNITED STATES

MARCH 21, 2003

Mr. DOMENICI (for himself, Ms. CANTWELL, Mrs. MURRAY, and Mr. BINGAMAN) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

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## A BILL

To authorize funding for Genomes to Life Research and Development at the Department of Energy for fiscal years 2004 through 2008.

1       *Be it enacted by the Senate and House of Representa-*  
2       *tives of the United States of America in Congress assembled,*

3       **SECTION 1. SHORT TITLE.**

4       This Act may be cited as “The Genomes to Life Re-  
5       search and Development Act”.

6       **SEC. 2. FINDINGS.**

7       The Congress finds the following:

8               (1) The Department of Energy’s Genomes to  
9       Life initiative involves the emerging fields of systems

1 biology and proteomics, which address the ability to  
2 understand the composition and function of the bio-  
3 chemical networks and pathways that carry out the  
4 essential processes of living organisms.

5 (2) The Genomes to Life initiative builds on the  
6 Department of Energy's integral role in the Human  
7 Genome Project, which has led to the mapping, se-  
8 quencing and identification of genetic material.  
9 Genomes to Life will go beyond mapping to develop  
10 an understanding of how genetic components inter-  
11 act to perform cellular activities vital to life.

12 (3) The ability of the United States to respond  
13 to the national security, energy and environmental  
14 challenges of the 21st century will be driven by  
15 science and technology. An integrated and predictive  
16 understanding of biological systems will enable the  
17 United States to develop new technologies related to  
18 the detection of biological and chemical agents, en-  
19 ergy production, carbon sequestration, bioremedi-  
20 ation and other Department of Energy statutory  
21 missions. These advances will also enhance the  
22 strength of U.S. science, technology, and medicine  
23 generally.

24 (4) The fundamental intellectual challenges in-  
25 herent in the Genomes to Life initiative are consid-

erable, and require public support for basic and applied research and development. Significant advances in areas such as the characterization of multiprotein complexes and gene regulatory networks will be required before biologically-based solutions and technologies will be useful in national security applications, as well as to the energy, medical and agricultural industries.

(5) The development of new scientific instruments will also be required to advance Genomes to Life research. Such instruments are likely to be large and costly. Specialized facilities are also likely to be required in order to advance the field and to realize its promise. Such facilities will be sufficiently expensive that they will have to be located and constructed on a centralized basis, similar to a number of unique facilities already managed by the Department of Energy.

(6) Contributions from individual researchers as well as multidisciplinary research teams will be required to advance systems biology and proteomics.

(7) The Department of Energy's Office of Science is well suited to manage systems biology and proteomics research for the Department. Through its support of research and development pursuant to

1 the Department's statutory authorities, the Office of  
2 Science is the principal federal supporter of the re-  
3 search and development in the physical and com-  
4 putational sciences. The Office is also a significant  
5 source of federal support for research in genomics  
6 and the life sciences. The Office supports research  
7 and development by individual investigators and  
8 multidisciplinary teams, and manages special user  
9 facilities that serve investigators in both university  
10 and industry.

11 **SEC. 3. DEPARTMENT OF ENERGY PROGRAM.**

12 (a) ESTABLISHMENT.—The Secretary shall carry out  
13 a program of research, development, demonstration, and  
14 commercial application, to be known as the Genomes to  
15 Life Program, in systems biology and proteomics con-  
16 sistent with the Department's statutory authorities.

17 (b) PLANNING.—

18 (1) IN GENERAL.—The Secretary shall prepare  
19 a program plan describing how knowledge and capa-  
20 bilities would be developed by the program and ap-  
21 plied to Department missions relating to energy, en-  
22 vironmental cleanup, and mitigation of global cli-  
23 mate change.

1           (2) CONSULTATION.—The program plan will be  
2       developed in consultation with other relevant De-  
3       partment technology programs.

4           (3) LONG-TERM GOALS.—The program plan  
5       shall focus science and technology on long-term  
6       goals including—

7                   (A) contributing to U.S. independence  
8       from foreign energy sources,

9                   (B) stabilizing atmospheric levels of carbon  
10      dioxide to counter global warming,

11                  (C) advancing environmental cleanup, and

12                  (D) providing the science and technology  
13      basis for new industries in biotechnology.

14          (4) SPECIFIC GOALS.—The program plan shall  
15      identify appropriate research, development, dem-  
16      onstration, and commercial application activities to  
17      address the following issues within the next dec-  
18      ade—

19                  (A) identifying new biological sources of  
20      fuels and electricity, with particular emphasis  
21      on creating biological technologies for the pro-  
22      duction and utilization of hydrogen;

23                  (B) understanding the Earth's natural car-  
24      bon cycle and create strategies to stabilize at-  
25      mospheric carbon dioxide;

1 (C) developing a knowledge and capability  
2 base for exploring more cost effective cleanup  
3 strategies for Department sites; and

4 (D) capturing key biological processes in  
5 engineered systems not requiring living cells.

6 (c) PROGRAM EXECUTION.—In carrying out the pro-  
7 gram under this Act, the Secretary shall—

8 (1) support individual investigators and multi-  
9 disciplinary teams of investigators;

10 (2) subject to subsection (d), develop, plan, con-  
11 struct, acquire, or operate special equipment or fa-  
12 cilities for the use of investigators conducting re-  
13 search, development, demonstration, or commercial  
14 application in systems biology and proteomics;

15 (3) support technology transfer activities to  
16 benefit industry and other users of systems biology  
17 and proteomics;

18 (4) coordinate activities by the Department  
19 with industry and other federal agencies; and

20 (5) award funds authorized under this Act only  
21 after an impartial review of the scientific and tech-  
22 nical merit of the proposals for such awards has  
23 been carried out by or for the Department.

24 (d) GENOMES TO LIFE USER FACILITIES AND AN-  
25 CILLARY EQUIPMENT.—

1           (1) AUTHORIZATION.—Within the funds au-  
2           thorized to be appropriated pursuant to this Act, the  
3           amounts specified under section 4(b) shall, subject  
4           to appropriations, be available for projects to de-  
5           velop, plan, construct, acquire, or operate special  
6           equipment, instrumentation, or facilities for inves-  
7           tigators conducting research, development, dem-  
8           onstration, and commercial application in systems  
9           biology and proteomics and associated biological dis-  
10          ciplines.

11          (2) PROJECTS.—Projects under paragraph (1)  
12          may include—

13                (A) the identification and characterization  
14                of multiprotein complexes;

15                (B) characterization of gene regulatory  
16                networks; characterization of the functional rep-  
17                ertoire of complex microbial communities in  
18                their natural environments at the molecular  
19                level; and

20                (C) development of computational methods  
21                and capabilities to advance understanding of  
22                complex biological systems and predict their be-  
23                havior.

24          (3) FACILITIES.—Facilities under paragraph  
25          (1) may include facilities for—

1 (A) the production and characterization of  
2 proteins;

3 (B) whole proteome analysis;

4 (C) characterization and imaging of molec-  
5 ular machines; and

6 (D) analysis and modeling of cellular sys-  
7 tems.

8 (4) COLLABORATION.—The Secretary shall en-  
9 courage collaborations among universities, labora-  
10 tories and industry at facilities under this sub-  
11 section. All facilities under this subsection shall have  
12 a specific mission of technology transfer to other in-  
13 stitutions.

14 **SEC. 4. AUTHORIZATION OF APPROPRIATIONS.**

15 (a) TOTAL AUTHORIZATION.—The following sums  
16 are authorized to be appropriated to the Secretary, to re-  
17 main available until expended, for the purposes of carrying  
18 out this Act:

19 (1) \$100,000,000 for fiscal year 2004.

20 (2) \$170,000,000 for fiscal year 2005.

21 (3) \$325,000,000 for fiscal year 2006.

22 (4) \$415,000,000 for fiscal year 2007.

23 (5) \$455,000,000 for fiscal year 2008.

24 (b) USER FACILITIES AND ANCILLARY EQUIP-  
25 MENT.—Of the funds under subsection (a), the following



1 sums are authorized to be appropriated to carry out sec-  
2 tion 3(d):

3 (1) \$16,000,000 for fiscal year 2004.

4 (2) \$70,000,000 for fiscal year 2005.

5 (3) \$175,000,000 for fiscal year 2006.

6 (4) \$215,000,000 for fiscal year 2007.

7 (5) \$205,000,000 for fiscal year 2008.

8 **SEC. 5. DEFINITIONS.**

9 For purposes of this Act:

10 (1) DEPARTMENT.—The term “Department”  
11 means the Department of Energy.

12 (2) PROTEOMICS.—The term “proteomics”  
13 means the determination of the structure, function,  
14 and expression of the proteins encoded in any ge-  
15 nome, including new protein sequences encoded in a  
16 genome for which the structural or functional cor-  
17 relates are not currently known.

18 (3) SECRETARY.—The term “Secretary” means  
19 the Secretary of Energy, acting through the Biologi-  
20 cal and Environmental Research Program of the Of-  
21 fice of Science of the Department.

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