108TH CONGRESS 1ST SESSION

S. 189

AN ACT

- To authorize appropriations for nanoscience, nanoengineering, and nanotechnology research, and for other purposes.
 - 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 "21st Century
 - 5 Nanotechnology Research and Development Act".

1 SEC. 2. NATIONAL NANOTECHNOLOGY PROGRAM.

2	(a) National Nanotechnology Program.—The
3	President shall implement a National Nanotechnology
4	Program. Through appropriate agencies, councils, and the
5	National Nanotechnology Coordination Office established
6	in section 3, the Program shall—
7	(1) establish the goals, priorities, and metrics
8	for evaluation for Federal nanotechnology research,
9	development, and other activities;
10	(2) invest in Federal research and development
11	programs in nanotechnology and related sciences to
12	achieve those goals; and
13	(3) provide for interagency coordination of Fed-
14	eral nanotechnology research, development, and
15	other activities undertaken pursuant to the Pro-
16	gram.
17	(b) Program Activities.—The activities of the Pro-
18	gram shall include—
19	(1) developing a fundamental understanding of
20	matter that enables control and manipulation at the
21	nanoscale;
22	(2) providing grants to individual investigators
23	and interdisciplinary teams of investigators;
24	(3) establishing a network of advanced tech-
25	nology user facilities and centers;

1	(4) establishing, on a merit-reviewed and com-
2	petitive basis, interdisciplinary nanotechnology re-
3	search centers, which shall—
4	(A) interact and collaborate to foster the
5	exchange of technical information and best
6	practices;
7	(B) involve academic institutions or na-
8	tional laboratories and other partners, which
9	may include States and industry;
10	(C) make use of existing expertise in
11	nanotechnology in their regions and nationally;
12	(D) make use of ongoing research and de-
13	velopment at the micrometer scale to support
14	their work in nanotechnology; and
15	(E) to the greatest extent possible, be es-
16	tablished in geographically diverse locations, en-
17	courage the participation of Historically Black
18	Colleges and Universities that are part B insti-
19	tutions as defined in section 322(2) of the
20	Higher Education Act of 1965 (20 U.S.C.
21	1061(2)) and minority institutions (as defined
22	in section 365(3) of that Act (20 U.S.C.
23	1067k(3))), and include institutions located in

States participating in the Experimental Pro-

1	gram to Stimulate Competitive Research
2	(EPSCoR);
3	(5) ensuring United States global leadership in
4	the development and application of nanotechnology
5	(6) advancing the United States productivity
6	and industrial competitiveness through stable, con-
7	sistent, and coordinated investments in long-term
8	scientific and engineering research in
9	nanotechnology;
10	(7) accelerating the deployment and application
11	of nanotechnology research and development in the
12	private sector, including startup companies;
13	(8) encouraging interdisciplinary research, and
14	ensuring that processes for solicitation and evalua-
15	tion of proposals under the Program encourage
16	interdisciplinary projects and collaborations;
17	(9) providing effective education and training
18	for researchers and professionals skilled in the inter-
19	disciplinary perspectives necessary for
20	nanotechnology so that a true interdisciplinary re-
21	search culture for nanoscale science, engineering
22	and technology can emerge;
23	(10) ensuring that ethical, legal, environmental
24	and other appropriate societal concerns, including

the potential use of nanotechnology in enhancing

- human intelligence and in developing artificial intelligence which exceeds human capacity, are considered during the development of nanotechnology by—
 - (A) establishing a research program to identify ethical, legal, environmental, and other appropriate societal concerns related to nanotechnology, and ensuring that the results of such research are widely disseminated;
 - (B) requiring that interdisciplinary nanotechnology research centers established under paragraph (4) include activities that address societal, ethical, and environmental concerns;
 - (C) insofar as possible, integrating research on societal, ethical, and environmental concerns with nanotechnology research and development, and ensuring that advances in nanotechnology bring about improvements in quality of life for all Americans; and
 - (D) providing, through the National Nanotechnology Coordination Office established in section 3, for public input and outreach to be integrated into the Program by the convening of regular and ongoing public discussions, through mechanisms such as citizens' panels,

1	consensus conferences, and educational events,
2	as appropriate; and
3	(11) encouraging research on nanotechnology
4	advances that utilize existing processes and tech-
5	nologies.
6	(c) Program Management.—The National Science
7	and Technology Council shall oversee the planning, man-
8	agement, and coordination of the Program. The Council,
9	itself or through an appropriate subgroup it designates or
10	establishes, shall—
11	(1) establish goals and priorities for the Pro-
12	gram, based on national needs for a set of broad ap-
13	plications of nanotechnology;
14	(2) establish program component areas, with
15	specific priorities and technical goals, that reflect the
16	goals and priorities established for the Program;
17	(3) oversee interagency coordination of the Pro-
18	gram, including with the activities of the Defense
19	Nanotechnology Research and Development Pro-
20	gram established under section 246 of the Bob
21	Stump National Defense Authorization Act for Fis-
22	cal Year 2003 (Public Law 107–314) and the Na-
23	tional Institutes of Health;
24	(4) develop, within 12 months after the date of
25	enactment of this Act, and update every 3 years

1	thereafter, a strategic plan to guide the activities de-
2	scribed under subsection (b), meet the goals, prior-
3	ities, and anticipated outcomes of the participating
4	agencies, and describe—
5	(A) how the Program will move results out
6	of the laboratory and into application for the
7	benefit of society;
8	(B) the Program's support for long-term
9	funding for interdisciplinary research and devel-
10	opment in nanotechnology; and
11	(C) the allocation of funding for inter-
12	agency nanotechnology projects;
13	(5) propose a coordinated interagency budget
14	for the Program to the Office of Management and
15	Budget to ensure the maintenance of a balanced
16	nanotechnology research portfolio and an appro-
17	priate level of research effort;
18	(6) exchange information with academic, indus-
19	try, State and local government (including State and
20	regional nanotechnology programs), and other ap-
21	propriate groups conducting research on and using
22	nanotechnology;
23	(7) develop a plan to utilize Federal programs,
24	such as the Small Business Innovation Research
25	Program and the Small Business Technology Trans-

- fer Research Program, in support of the activity
 stated in subsection (b)(7);
 - (8) identify research areas that are not being adequately addressed by the agencies' current research programs and address such research areas;
 - (9) encourage progress on Program activities through the utilization of existing manufacturing facilities and industrial infrastructures such as, but not limited to, the employment of underutilized manufacturing facilities in areas of high unemployment as production engineering and research testbeds; and
 - (10) in carrying out its responsibilities under paragraphs (1) through (9), take into consideration the recommendations of the Advisory Panel, suggestions or recommendations developed pursuant to subsection (b)(10)(D), and the views of academic, State, industry, and other appropriate groups conducting research on and using nanotechnology.
- 19 (d) Annual Report.—The Council shall prepare an 20 annual report, to be submitted to the Senate Committee 21 on Commerce, Science, and Transportation and the House 22 of Representatives Committee on Science, and other ap-23 propriate committees, at the time of the President's budg-

24 et request to Congress, that includes—

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- (1) the Program budget, for the current fiscal year, for each agency that participates in the Program, including a breakout of spending for the development and acquisition of research facilities and instrumentation, for each program component area, and for all activities pursuant to subsection (b)(10);
 - (2) the proposed Program budget for the next fiscal year, for each agency that participates in the Program, including a breakout of spending for the development and acquisition of research facilities and instrumentation, for each program component area, and for all activities pursuant to subsection (b)(10);
 - (3) an analysis of the progress made toward achieving the goals and priorities established for the Program;
 - (4) an analysis of the extent to which the Program has incorporated the recommendations of the Advisory Panel; and
 - (5) an assessment of how Federal agencies are implementing the plan described in subsection (c)(7), and a description of the amount of Small Business Innovative Research and Small Business Technology Transfer Research funds supporting the plan.

1 SEC. 3. PROGRAM COORDINATION.

2	(a) In General.—The President shall establish a
3	National Nanotechnology Coordination Office, with a Di-

- 4 rector and full-time staff, which shall—
- (1) provide technical and administrative support
 to the Council and the Advisory Panel;
- 7 (2) serve as the point of contact on Federal 8 nanotechnology activities for government organiza-9 tions, academia, industry, professional societies, 10 State nanotechnology programs, interested citizen 11 groups, and others to exchange technical and pro-12 grammatic information;
 - (3) conduct public outreach, including dissemination of findings and recommendations of the Advisory Panel, as appropriate; and
- 16 (4) promote access to and early application of 17 the technologies, innovations, and expertise derived 18 from Program activities to agency missions and sys-19 tems across the Federal Government, and to United 20 States industry, including startup companies.
- 21 (b) Funding.—The National Nanotechnology Co-
- 22 ordination Office shall be funded through interagency
- 23 funding in accordance with section 631 of Public Law
- 24 108–7.

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- 25 (c) Report.—Within 90 days after the date of enact-
- 26 ment of this Act, the Director of the Office of Science and

- 1 Technology Policy shall report to the Senate Committee
- 2 on Commerce, Science, and Transportation, and the
- 3 House of Representatives Committee on Science on the
- 4 funding of the National Nanotechnology Coordination Of-
- 5 fice. The report shall include—
- 6 (1) the amount of funding required to ade-
- 7 quately fund the Office;
- 8 (2) the adequacy of existing mechanisms to
- 9 fund this Office; and
- 10 (3) the actions taken by the Director to ensure
- stable funding of this Office.
- 12 SEC. 4. ADVISORY PANEL.
- 13 (a) In General.—The President shall establish or
- 14 designate a National Nanotechnology Advisory Panel.
- 15 (b) QUALIFICATIONS.—The Advisory Panel estab-
- 16 lished or designated by the President under subsection (a)
- 17 shall consist primarily of members from academic institu-
- 18 tions and industry. Members of the Advisory Panel shall
- 19 be qualified to provide advice and information on
- 20 nanotechnology research, development, demonstrations,
- 21 education, technology transfer, commercial application, or
- 22 societal and ethical concerns. In selecting or designating
- 23 an Advisory Panel, the President may also seek and give
- 24 consideration to recommendations from the Congress, in-
- 25 dustry, the scientific community (including the National

1	Academy of Sciences, scientific professional societies, and
2	academia), the defense community, State and local govern-
3	ments, regional nanotechnology programs, and other ap-
4	propriate organizations.
5	(c) Duties.—The Advisory Panel shall advise the
6	President and the Council on matters relating to the Pro-
7	gram, including assessing—
8	(1) trends and developments in nanotechnology
9	science and engineering;
10	(2) progress made in implementing the Pro-
11	gram;
12	(3) the need to revise the Program;
13	(4) the balance among the components of the
14	Program, including funding levels for the program
15	component areas;
16	(5) whether the program component areas, pri-
17	orities, and technical goals developed by the Council
18	are helping to maintain United States leadership in
19	nanotechnology;
20	(6) the management, coordination, implementa-
21	tion, and activities of the Program; and
22	(7) whether societal, ethical, legal, environ-
23	mental, and workforce concerns are adequately ad-

dressed by the Program.

- 1 (d) Reports.—The Advisory Panel shall report, not
- 2 less frequently than once every 2 fiscal years, to the Presi-
- 3 dent on its assessments under subsection (c) and its rec-
- 4 ommendations for ways to improve the Program. The first
- 5 report under this subsection shall be submitted within 1
- 6 year after the date of enactment of this Act. The Director
- 7 of the Office of Science and Technology Policy shall trans-
- 8 mit a copy of each report under this subsection to the Sen-
- 9 ate Committee on Commerce, Science, and Technology,
- 10 the House of Representatives Committee on Science, and
- 11 other appropriate committees of the Congress.
- 12 (e) Travel Expenses of Non-Federal Mem-
- 13 Bers.—Non-Federal members of the Advisory Panel,
- 14 while attending meetings of the Advisory Panel or while
- 15 otherwise serving at the request of the head of the Advi-
- 16 sory Panel away from their homes or regular places of
- 17 business, may be allowed travel expenses, including per
- 18 diem in lieu of subsistence, as authorized by section 5703
- 19 of title 5, United States Code, for individuals in the gov-
- 20 ernment serving without pay. Nothing in this subsection
- 21 shall be construed to prohibit members of the Advisory
- 22 Panel who are officers or employees of the United States
- 23 from being allowed travel expenses, including per diem in
- 24 lieu of subsistence, in accordance with existing law.

1	(f) Exemption from Sunset.—Section 14 of the
2	Federal Advisory Committee Act shall not apply to the
3	Advisory Panel.
4	SEC. 5. TRIENNIAL EXTERNAL REVIEW OF THE NATIONAL
5	NANOTECHNOLOGY PROGRAM.
6	(a) In General.—The Director of the National
7	Nanotechnology Coordination Office shall enter into an ar-
8	rangement with the National Research Council of the Na-
9	tional Academy of Sciences to conduct a triennial evalua-
10	tion of the Program, including—
11	(1) an evaluation of the technical accomplish-
12	ments of the Program, including a review of whether
13	the Program has achieved the goals under the
14	metrics established by the Council;
15	(2) a review of the Program's management and
16	coordination across agencies and disciplines;
17	(3) a review of the funding levels at each agen-
18	cy for the Program's activities and the ability of
19	each agency to achieve the Program's stated goals
20	with that funding;
21	(4) an evaluation of the Program's success in
22	transferring technology to the private sector;
23	(5) an evaluation of whether the Program has
24	been successful in fostering interdisciplinary re-
25	search and development.

(6) an evaluation of the extent to which the
Program has adequately considered ethical, legal,
environmental, and other appropriate societal con-
cerns;
(7) recommendations for new or revised Pro-
gram goals;
(8) recommendations for new research areas,
partnerships, coordination and management mecha-
nisms, or programs to be established to achieve the
Program's stated goals;
(9) recommendations on policy, program, and
budget changes with respect to nanotechnology re-
search and development activities;
(10) recommendations for improved metrics to
evaluate the success of the Program in accom-
plishing its stated goals;
(11) a review of the performance of the Na-
tional Nanotechnology Coordination Office and its
efforts to promote access to and early application of
the technologies, innovations, and expertise derived
from Program activities to agency missions and sys-
tems across the Federal Government and to United
States industry;

(12) an analysis of the relative position of the

United States compared to other nations with re-

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1	spect to nanotechnology research and development
2	including the identification of any critical research
3	areas where the United States should be the world
4	leader to best achieve the goals of the Program; and
5	(13) an analysis of the current impact of
6	nanotechnology on the United States economy and
7	recommendations for increasing its future impact.
8	(b) STUDY ON MOLECULAR SELF-ASSEMBLY.—As
9	part of the first triennial review conducted in accordance
10	with subsection (a), the National Research Council shall
11	conduct a one-time study to determine the technical feasi-
12	bility of molecular self-assembly for the manufacture of
13	materials and devices at the molecular scale.
14	(c) Study on the Responsible Development of
15	NANOTECHNOLOGY.—As part of the first triennial review
16	conducted in accordance with subsection (a), the National
17	Research Council shall conduct a one-time study to assess
18	the need for standards, guidelines, or strategies for ensur-
19	ing the responsible development of nanotechnolgy, includ-
20	ing, but not limited to—
21	(1) self-replicating nanoscale machines or de-
22	vices;

(2) the release of such machines in natural en-

25 (3) encryption;

vironments;

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1	(4) the development of defensive technologies;
2	(5) the use of nanotechnology in the enhance-
3	ment of human intelligence; and
4	(6) the use of nanotechnology in developing ar-
5	tificial intelligence.
6	(d) Evaluation to be Transmitted to Con-
7	GRESS.—The Director of the National Nanotechnology
8	Coordination Office shall transmit the results of any eval-
9	uation for which it made arrangements under subsection
10	(a) to the Advisory Panel, the Senate Committee on Com-
11	merce, Science, and Transportation and the House of Rep-
12	resentatives Committee on Science upon receipt. The first
13	such evaluation shall be transmitted no later than June
14	10, 2005, with subsequent evaluations transmitted to the
15	Committees every 3 years thereafter.
16	SEC. 6. AUTHORIZATION OF APPROPRIATIONS.
17	(a) NATIONAL SCIENCE FOUNDATION.—There are
18	authorized to be appropriated to the Director of the Na-
19	tional Science Foundation to carry out the Director's re-
20	sponsibilities under this Act—
21	(1) \$385,000,000 for fiscal year 2005;
22	(2) \$424,000,000 for fiscal year 2006;
23	(3) \$449,000,000 for fiscal year 2007; and
24	(4) \$476,000,000 for fiscal year 2008.

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        (b) DEPARTMENT OF ENERGY.—There are author-
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   ized to be appropriated to the Secretary of Energy to carry
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    out the Secretary's responsibilities under this Act—
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             (1) $317,000,000 for fiscal year 2005;
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             (2) $347,000,000 for fiscal year 2006;
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             (3) $380,000,000 for fiscal year 2007; and
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             (4) $415,000,000 for fiscal year 2008.
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        (c) National Aeronautics and Space Adminis-
   TRATION.—There are authorized to be appropriated to the
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   Administrator of the National Aeronautics and Space Ad-
   ministration to carry out the Administrator's responsibil-
   ities under this Act—
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             (1) $34,100,000 for fiscal year 2005;
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             (2) $37,500,000 for fiscal year 2006;
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             (3) $40,000,000 for fiscal year 2007; and
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             (4) $42,300,000 for fiscal year 2008.
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            NATIONAL INSTITUTE OF STANDARDS AND
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    Technology.—There are authorized to be appropriated
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    to the Director of the National Institute of Standards and
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    Technology to carry out the Director's responsibilities
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   under this Act—
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             (1) $68,200,000 for fiscal year 2005;
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             (2) $75,000,000 for fiscal year 2006;
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             (3) $80,000,000 for fiscal year 2007; and
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             (4) $84,000,000 for fiscal year 2008.
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1 (e) Environmental Protection Agency.—There are authorized to be appropriated to the Administrator of 3 the Environmental Protection Agency to carry out the Administrator's responsibilities under this Act— 5 (1) \$5,500,000 for fiscal year 2005; 6 (2) \$6,050,000 for fiscal year 2006; 7 (3) \$6,413,000 for fiscal year 2007; and 8 (4) \$6,800,000 for fiscal year 2008. SEC. 7. DEPARTMENT OF COMMERCE PROGRAMS. 10 (a) NIST Programs.—The Director of the National Institute of Standards and Technology shall— 12 (1) as part of the Program activities under sec-13 tion 2(b)(7), establish a program to conduct basic 14 research on issues related to the development and 15 manufacture of nanotechnology, including metrology; 16 reliability and quality assurance; processes control; 17 and manufacturing best practices; and 18 (2) utilize the Manufacturing Extension Part-19 nership program to the extent possible to ensure 20 that the research conducted under paragraph (1) 21 reaches small- and medium-sized manufacturing 22 companies. 23 (b) CLEARINGHOUSE.—The Secretary of Commerce his designee, in consultation with the National Nanotechnology Coordination Office and, to the extent

- 1 possible, utilizing resources at the National Technical In-
- 2 formation Service, shall establish a clearinghouse of infor-
- 3 mation related to commercialization of nanotechnology re-
- 4 search, including information relating to activities by re-
- 5 gional, State, and local commercial nanotechnology initia-
- 6 tives; transition of research, technologies, and concepts
- 7 from Federal nanotechnology research and development
- 8 programs into commercial and military products; best
- 9 practices by government, universities and private sector
- 10 laboratories transitioning technology to commercial use;
- 11 examples of ways to overcome barriers and challenges to
- 12 technology deployment; and use of manufacturing infra-
- 13 structure and workforce.

14 SEC. 8. DEPARTMENT OF ENERGY PROGRAMS.

- 15 (a) Research Consortia.—
- 16 (1) Department of energy program.—The
- 17 Secretary of Energy shall establish a program to
- support, on a merit-reviewed and competitive basis,
- 19 consortia to conduct interdisciplinary nanotechnology
- 20 research and development designed to integrate
- 21 newly developed nanotechnology and microfluidic
- tools with systems biology and molecular imaging.
- 23 (2) Authorization of appropriations.—Of
- the sums authorized for the Department of Energy
- under section 6(b), \$25,000,000 shall be used for

- each fiscal year 2005 through 2008 to carry out this
- 2 section. Of these amounts, not less than
- 3 \$10,000,000 shall be provided to at least 1 consor-
- 4 tium for each fiscal year.
- 5 (b) Research Centers and Major Instrumenta-
- 6 TION.—The Secretary of Energy shall carry out projects
- 7 to develop, plan, construct, acquire, operate, or support
- 8 special equipment, instrumentation, or facilities for inves-
- 9 tigators conducting research and development in
- 10 nanotechnology.

11 SEC. 9. ADDITIONAL CENTERS.

- 12 (a) American Nanotechnology Preparedness
- 13 Center.—The Program shall provide for the establish-
- 14 ment, on a merit-reviewed and competitive basis, of an
- 15 American Nanotechnology Preparedness Center which
- 16 shall—
- 17 (1) conduct, coordinate, collect, and disseminate
- studies on the societal, ethical, environmental, edu-
- 19 cational, legal, and workforce implications of
- 20 nanotechnology; and
- 21 (2) identify anticipated issues related to the re-
- sponsible research, development, and application of
- 23 nanotechnology, as well as provide recommendations
- for preventing or addressing such issues.

1	(b) Center for Nanomaterials Manufac-
2	TURING.—The Program shall provide for the establish-
3	ment, on a merit reviewed and competitive basis, of a cen-
4	ter to—
5	(1) encourage, conduct, coordinate, commission,
6	collect, and disseminate research on new manufac-
7	turing technologies for materials, devices, and sys-
8	tems with new combinations of characteristics, such
9	as, but not limited to, strength, toughness, density,
10	conductivity, flame resistance, and membrane sepa-
11	ration characteristics; and
12	(2) develop mechanisms to transfer such manu-
13	facturing technologies to United States industries.
14	(c) Reports.—The Council, through the Director of
15	the National Nanotechnology Coordination Office, shall
16	submit to the Senate Committee on Commerce, Science,
17	and Transportation and the House of Representatives
18	Committee on Science—
19	(1) within 6 months after the date of enactment
20	of this Act, a report identifying which agency shall
21	be the lead agency and which other agencies, if any,
22	will be responsible for establishing the Centers de-
23	scribed in this section: and

1	(2) within 18 months after the date of enact
2	ment of this Act, a report describing how the Cen
3	ters described in this section have been established
4	SEC. 10. DEFINITIONS.
5	In this Act:
6	(1) Advisory Panel.—The term "Advisory
7	Panel" means the President's Nationa
8	Nanotechnology Advisory Panel established or des
9	ignated under section 4.
10	(2) Nanotechnology.—The term
11	"nanotechnology" means the science and technology
12	that will enable one to understand, measure, manip
13	ulate, and manufacture at the atomic, molecular
14	and supramolecular levels, aimed at creating mate
15	rials, devices, and systems with fundamentally new
16	molecular organization, properties, and functions.
17	(3) Program.—The term "Program" means
18	the National Nanotechnology Program established
19	under section 2.
20	(4) COUNCIL.—The term "Council" means the
21	National Science and Technology Council or an ap
22	propriate subgroup designated by the Council under
23	section 2(c).
24	(5) Advanced technology user facility.—
25	The term "advanced technology user facility" means

	a nanotechnology research and development facility
2	supported, in whole or in part, by Federal funds
3	that is open to all United States researchers on a
1	competitive, merit-reviewed basis.

(6) Program component area" means a major subject area established under section 2(c)(2) under which is grouped related individual projects and activities carried out under the Program.

Passed the Senate November 18, 2003.

Attest:

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Secretary.

 $^{\tiny 108\text{TH CONGRESS}}_{\tiny 18\text{T Session}} \text{ S. } 189$

AN ACT

To authorize appropriations for nanoscience, nanoengineering, and nanotechnology research, and for other purposes.