

Science + Technology

IN CONGRESS

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FY 2002 R&D Budget: Agency Highlights

On April 9, the Bush Administration released details of its fiscal year (FY) 2002 budget request which contained an overall increase for the total federal investment in research and development (R&D), but cuts in most of the individual sponsoring agencies. The budget calls for overall discretionary spending to rise 4 percent or \$26 billion in FY 2002 to \$661 billion. Almost the entire requested increase would go to top priority agencies, the Department of Defense (DOD), the Department of Education, and the National Institutes of Health (NIH), and a reserve for emergencies. All other discretionary programs, including R&D programs outside NIH and DOD, would be left with flat or declining budgets.

The request for total federal R&D in FY 2002 is a record \$95.3 billion, \$5.2 billion or 5.8 percent more than FY 2001 (see table on page 3). The proposed increases for DOD (\$3.6 billion) and NIH (\$2.7 billion) account for more than the overall \$5.2 billion increase, hence, all other R&D funding agencies combined are left with less money than in FY 2001.

R&D in the U.S. Department of Agriculture (USDA) would fall 8.1 percent in FY 2002 to \$1.8 billion, reversing a similarly-sized increase last year. Funding for competitive research grants in the National Research Initiative (\$106 million) and for-

mula research funds in the Hatch Act (\$180 million) would stay even with FY 2001, while the Bush Administration would find savings by not renewing more than \$120 million in congressionally designated research projects. Intramural research in the Agricultural Research Service (ARS) would stay even with FY 2001 at \$852 million, but there would be \$44 million in cuts to projects in ARS Buildings and Facilities (down 27 percent to \$118 million), many of them congressionally designated.

Department of Commerce R&D programs would decline 6.1 percent in FY 2002 to \$1.0 billion. The budget would all but eliminate the Advanced Technology Program (ATP) at the National Institute of Standards and Technology (NIST) in FY 2002 (down 91 percent to \$13 million) and would allow FY 2001 funds to be used only to fund existing ATP awards. Intramural R&D in the NIST laboratories, however, would increase 11 percent. National Oceanic and Atmo-

>>> *Continued on page 2*

Cloning Genie Out of the Bottle?

Claims from two groups that they plan to produce a human clone in the near future has sparked a furor of legislative activity and prompted a hearing to showcase the controversial topic. The March 28 hearing before the House Committee on Energy and Commerce brought Dr. Brigitte Boiseelier, a scientist working for Clonaid, the company established by the Raëlian religious group, and fertility researcher Dr. Panos Zavos to discuss their plans to provide reproductive cloning services. Other witnesses decried their efforts as unsafe, unethical and irresponsible, and said they could cause a backlash that would suppress the pursuit of other legitimate forms of cloning research.

Both Boiseelier and Zavos argue that research in the field of somatic cell nuclear transfer (the process that created Dolly the sheep) is sufficiently advanced to warrant the cloning of human beings. Dr. Boiseelier claims that research at Clonaid is being conducted in a secret location somewhere in the United States and that a couple has already contacted them to clone their son who died in infancy. In a letter submitted to the committee, she stated, "[O]n behalf of the couples who have hopes, on behalf of the scientists who are told not to proceed, I am respectfully asking you to secure two basic freedoms: The free-

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"It's the old fear of putting up a tin can that isn't capable of doing good science."

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R&D

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spheric Administration (NOAA) R&D would increase by 2.2 percent to \$649 million, including program increases for Oceanic and Atmospheric Research (OAR).

The Department of Defense (DOD), the largest federal sponsor of R&D, did not submit a full FY 2002 budget on April 9th; the agency is currently undergoing a major review of defense spending priorities that is expected to result in a full FY 2002 request in May. In the meantime, most of the DOD request consists of placeholder figures assuming the FY 2001 budget plus inflation, but there is also a special request for an extra \$2.6 billion in unallocated funds for DOD development (6.3 account), presumably for national missile defense and other administration priorities. DOD R&D would increase 8.6 percent because of the special request, for a total of \$45.2 billion. The placeholder budget assumes for the moment that basic research (6.1 account), applied research (6.2 account) and individual agencies such as the Defense Advanced Research Projects Agency would all grow by 2.1 percent in FY 2002.

The Department of Energy (DOE) would see its R&D programs decline 3.3 percent to \$7.4 billion after a 12 percent increase last year. Most programs in the Office of Science would receive level or slightly increased funding, including Basic Energy Sciences (up 1.3 percent to \$1.0 billion), Advanced Scientific Computing Research (unchanged at \$166 million), Nuclear Physics (unchanged at \$361 million), and High Energy Physics (up 1.3 percent to \$721 million). Biological and Environmental Research would fall 8.2 percent to \$443 million, mostly because of the deletion of congressionally designated projects. Funding for the Spallation Neutron Source would rise \$13 million to \$291 million. Energy R&D, however, would suffer steep cuts: solar and renewable energy R&D would drop by more than a third, nuclear energy R&D would be almost halved, and energy conservation R&D would fall by nearly 25 percent. In Fossil Energy, a new Coal for Clean Power Initiative of competitive, cost-shared R&D grants funded at \$150 million would offset steep cuts in gas, oil, and other fossil energy R&D program areas. In DOE's defense programs, construction of the troubled National Ignition

Facility would continue with a 24 percent boost to \$245 million, while the Advanced Simulation and Computing Initiative (ASCI) would receive \$738 million, a slight decrease.

R&D in the Department of the Interior would fall 6.2 percent to \$593 million, but steeper cuts would fall on Interior's lead science agency, the U.S. Geological Survey (USGS). USGS R&D would decrease 10.7 percent or \$59 million to \$491 million. Hardest hit would be programs in Water Resources (down 21.6 percent as a result of the elimination of some programs and dramatic reductions in the National Water Quality Assessment program) and Biological Research (down 7.0 percent because of the elimination of the National Biological Information Infrastructure program).

Department of Transportation (DOT) R&D funding would climb 7.0 percent to \$795 million. Many DOT programs do not compete with other discretionary programs for funding because they rely on guaranteed spending from transportation trust funds. Because transportation tax revenues have been rising steadily, R&D funding would also rise. Federal Highway Administration (FHWA) R&D would increase by 27.6 percent to \$374 million, including a 32 percent boost to \$253 million for Intelligent Transportation Systems.

The Environmental Protection Agency (EPA) R&D budget would fall 6.1 percent to \$575 million, mostly because of the elimination of dozens of congressionally designated research projects. EPA's core research programs would mostly be held to level funding. The overall EPA budget would decline from \$7.8 billion in FY 2001 to \$7.3 billion in FY 2002.

The National Aeronautics and Space Administration (NASA) R&D programs would decline 3.3 percent to \$9.3 billion. While Space Science would increase by 6.2 percent to \$2.8 billion, there would be cuts totaling \$200 million (11.7 percent) in the Earth Science enterprise to \$1.5 billion. Biological and Physical Research (formerly Life and Microgravity Sciences) would decline 4.7 percent to \$361 million. Aero-Space Technology would increase 7.3 percent to \$2.4 billion because of a more than \$200 million increase to \$475 million for the Space Launch Initiative to explore technolo-

gies for reusable launch vehicles. While the budget contains a \$2.1 billion request for the International Space Station (down 1.2 percent), there are no details for FY 2002 because the entire project is currently undergoing a major review which will likely result in a heavily restructured and scaled-down station (see story on page 4).

The National Institutes of Health (NIH) would receive \$23.1 billion for its total budget in FY 2002, an unprecedented increase of \$2.8 billion (13.5 percent) that would keep NIH on track to double its budget in the five years between FY 1998 and 2003. NIH R&D would rise 13.6 percent to \$22.4 billion, with most of the institutes receiving increases between 11.5 and 12.5 percent. The NIH budget would emphasize investments in R&D facilities, both for extramural research facilities grants (\$100 million, up from \$78 million) and intramural construction (\$307 million, double the FY 2001 funding level). Funding for the Office of Research on Women's Health within the Office of the Director would more than double, and the new National Institute of Minority Health and Health Disparities would receive a nearly 20 percent boost in its budget to \$158 million. The new National Institute of Biomedical Imaging and Bioengineering would receive \$40 million, up from \$2 million.

The National Science Foundation's (NSF) R&D investments would decline 1.7 percent to \$3.2 billion. There would be an expansion of NSF's science and mathematics education activities, but most of the research directorates in Research and Related Activities (R&RA; down 0.5 percent to \$3.3 billion) would face budget cuts. Only astronomy, mathematics, and nanotechnology-related research would receive inflationary increases, leaving research in nearly 30 other program areas such as information technology research, physics, and the social sciences with flat or declining funding. The budget would also cut NSF's investments in research instrumentation by a third and Major Research Equipment by more than 20 percent. ●●●

FOR MORE INFORMATION:

AAAS R&D Budget and Policy Program:
www.aaas.org/spp/R&D

R&D in the FY 2002 Budget by Agency
(budget authority in millions of dollars; as of May 1, 2001)

	FY 2000	FY 2001	FY 2002	Change FY 01-02	
	Actual	Estimate	Budget	Amount	Percent
Defense (military)*	39,959	42,258	45,855	3,597	8.5%
<i>S&T (6.1-6.3 + medical)*</i>	8,603	9,392	9,589	197	2.1%
<i>All Other DOD R&D*</i>	31,356	32,866	36,266	3,400	10.3%
Health and Human Services	18,182	20,859	23,496	2,637	12.6%
<i>Nat'l Institutes of Health</i>	17,234	19,710	22,395	2,685	13.6%
NASA	9,494	9,925	9,967	41	0.4%
Energy	6,956	7,744	7,399	-346	-4.5%
<i>NNSA and other defense</i>	3,201	3,499	3,542	42	1.2%
<i>Energy and Science programs</i>	3,755	4,245	3,857	-388	-9.1%
Nat'l Science Foundation	2,931	3,279	3,226	-52	-1.6%
Agriculture	1,776	1,961	1,803	-158	-8.1%
Commerce	1,174	1,201	1,110	-91	-7.6%
<i>NOAA</i>	643	726	772	47	6.4%
<i>NIST</i>	471	421	313	-108	-25.7%
Interior	618	631	593	-39	-6.1%
Transportation	607	747	798	51	6.8%
Environ. Protection Agency	558	609	569	-40	-6.5%
Veterans Affairs	645	703	722	19	2.7%
Education	238	265	259	-6	-2.3%
All Other	630	704	663	-41	-5.8%
Total R&D	83,769	90,887	96,459	5,572	6.1%
Defense R&D	43,160	45,757	49,397	3,639	8.0%
Nondefense R&D	40,609	45,130	47,062	1,933	4.3%
<i>Nondefense R&D excluding NIH</i>	23,374	25,420	24,668	-752	-3.0%
Basic Research	19,468	22,014	23,343	1,329	6.0%
Applied Research	18,957	21,439	22,455	1,019	4.8%
Development	40,425	42,367	45,561	3,195	7.5%
R&D Facilities and Equipment	4,919	5,068	5,097	29	0.6%

Based on OMB data for FY 2002, agency budget justifications, and information from agency budget offices.

*FY 2002 DOD figures represent a projection from FY 2001 funding levels plus inflation, plus an additional \$2.6 billion (in development) for unspecified projects. The revised FY 2002 request will be released in May.

Bush Goes Ahead on Medical Privacy

The Bush Administration announced in April that it would immediately implement medical privacy regulations put forth last year by the Clinton Administration. The rules, which were postponed by Health and Human Services Secretary Tommy Thompson, will provide the first-ever federal floor for medical privacy standards.

The rules were initially scheduled to take effect on February 14th, however, in the face of increasing protests from the health care community regarding implementation costs, Secretary Thompson decided to allow an additional 60-day comment period. On April 12th, two days before the end of the comment period, he said that the rules would go forward. The health care industry will now have two years before it is required to comply. During the first year, however, Secretary Thompson will be able to alter the rules, and he has already said that changes are not out of the question.

Advocates of the regulations were pleased that the rules have thus far been left largely untouched—the only change is that parents will be able to access their children's records. However, they are now preparing for a year-long battle over possible further changes. ●●●

AAAS NOTES

- **SPRING - SUMMER, 2001**
Look for announcements about the new AAAS congressional seminar series on concerns related to genetic discrimination. Upcoming topics will include the state of the science of genetic testing, and the effect of fears of discrimination on medical research. Check the series' website for up-to-date information.
>>> www.aaas.org/spp/cstc/genetic

NASA Struggles with Latest Space Station Overruns

In a recent hearing, NASA Administrator Daniel Goldin told the House Science Committee that the International Space Station (ISS) is expected to be \$4 billion over budget by 2006. According to Goldin, the overruns are the result of poor cost projections stemming from unanticipated technical difficulties as well as unforeseen surges in program activity. If the estimated \$4 billion increase becomes a reality, it would force NASA to exceed a congressionally mandated \$25 billion cap (H.R. 1654) placed on program spending last year.

In an effort to remain below the cap, NASA's fiscal year (FY) 2002 budget will redirect funds from high-cost elements

raised this to \$22.7 billion, and it has since ballooned to the current estimate of \$28-30 billion, a sum which includes the expected \$4 billion overrun.

All told, the past seventeen years have seen the space station redesigned six times; the structural design has been reduced by 50 percent while total cost estimates have nearly quadrupled.

In his testimony before the Science Committee, Goldin explained that the new overruns were first discovered last November following the delayed launch of the Russian Zvezda Service Module. Unexpectedly high monthly expenditures prompted a new assessment of budgetary risks revealing a projected \$4 billion overrun.

"First and foremost, the cost growth is driven by the unprecedented technical and management complexity of the ISS program," said Goldin. He cited the advanced life-support systems, Space Module training facility, and software integration as examples, saying that technical difficulties with each added to the burgeoning costs. Compounding this were the programmatic delays on the part of the Russians during 1999-2000. During the delay-induced hiatus, "...under-spending in operations and other parts of the program, and a history of year-to-year carryover led to an assessment...that program funding was adequate but reserves were tight," he said. After Russia's completion of the service module, the pace of assembly at NASA increased dramatically and the "true cost of permanently-crewed operations was experienced," remarked Goldin.

Goldin also attributed some blame for the overruns to NASA's primary contractor, the Boeing Corporation. He said that Boeing consistently underrepresented cost projections, making it difficult for NASA to provide Congress with accurate forecasts. In an effort to address these difficulties, NASA has requested funding in the FY 2002 budget to bring in 15 cost-projection consultants from the private sector.

In response, the Bush Administration established a new budget for NASA designed to achieve priority goals of the program, with the stipulation that no funding should be taken from programs outside the Human Space Flight Program. To achieve this, NASA proposes to terminate construc-

tion of the ISS after completion of the "U.S. Core," and launch of European and Japanese lab modules. NASA will then work with Congress to determine if further U.S. development of the ISS is possible.

In order to complete the "U.S. Core," which still lacks a docking node called "Node 2," funds will be redirected from a propulsion module, habitation module, an emergency Crew Return Vehicle (CRV), and measures to increase scientific research capability. Halting development of the CRV means that only three people could be on board the station at any given time due to present crew evacuation capacity.

NASA estimates that 2.5 people are required simply to run the station, so only half a person's time would be available for scientific research. This has many scientists concerned that NASA has lost sight of the ISS's primary goal of "world-class research in space." In addition, the fate of a Japanese-built centrifuge system is also uncertain under NASA's redirection plan. According to testimony by the Congressional Research Service's Marcia Smith, "Many in the scientific community consider the centrifuge to be one of the premier

After Russia's completion of the service module, the pace of assembly at NASA increased dramatically and the "true cost of permanently-crewed operations was experienced."

within the space station program that are still in the early stages of development. However, the overruns and NASA's plans to address them have angered many members of Congress and the scientific community.

Since its inception in 1984, the ISS has consistently been plagued by cost overruns. The station's initial cost estimate was \$8 billion with construction to be completed within ten years. The original space station concept envisaged three elements: an occupied base for 8 crew members and two automated research platforms. By 1989, estimated cost to completion had risen to \$14.5 billion (FY 1984 dollars), and development of the automated platforms had been halted due to budgetary constraints.

In 1993, NASA announced the initiation of the current ISS design estimated at \$17.4 billion and slated for completion in 2002. That year also marked the beginning of Russian involvement in the project. NASA maintained its cost estimates until March of 1998 when it announced a new projection of \$21.3 billion. In late 1998, NASA

Science Chairman Sherwood Boehlert asked Goldin if "part of the uniform at NASA is a pair of rose-colored glasses."

pieces of scientific equipment planned for the space station."

In a March 9 letter to NASA space flight chief Joe Rothenberg, Martin Fettman, chairman of NASA's space station biological research project science working group, wrote that if NASA goes ahead with the proposed redirections, "we might as well completely discontinue" science funding for the space station. The letter also warns that the entire life science community would "turn its support away" from the station. John McElroy, chair of the National Academy of Sciences' Space Studies Board echoed Fettman's frustrations: "It's the old fear of putting up a tin can that isn't capable of

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CONGRESSIONAL RESEARCH SERVICE

Copies of CRS reports for congressional use are available by calling 202/707-7132.

- **Federal Research and Development: Budgeting and Priority-Setting, 1993-2000 (RL30905)**
This report summarizes trends in federal support for non-defense research and development (R&D) from 1993-2000. Included are sections on presidential priority-setting as well as detailed summaries of R&D from FY 1996 to FY 2001. An analysis of parameters affecting priority-setting is also included.
- **U.S. National Science Foundation: Experimental Program to Stimulate Competitive Research (RL30930)**
This report examines the National Science Foundation's EPSCoR program. Included are sections covering EPSCoR's history, goals and mission, operations and funding, and effectiveness. Also included is a brief list of issues that may be of interest to the 107th Congress.
- **Pharmaceutical Research and Development: A Description and Analysis of the Process (RL30913)**
This report outlines the drug development process in the United States. It focuses primarily on aspects of the process contributing to the high cost of pharmaceuticals. The report also examines the clinical trial process with special emphasis on the importance of human subject protection. Also included is a section on possible congressional concerns as well as a section on the history of pharmaceutical R&D.
- **Energy Policy: Setting the Stage for the Current Debate (IB10080)**
This report provides a brief history of energy policy in the United States. Included are examinations of OPEC's effect on energy policy as well as an outline of the current state of U.S. energy policy. Also included is a summary of energy policy legislation in the 107th Congress.
- **Foot and Mouth Disease: A Threat to U.S. Agriculture (RS20890)**
This report describes the characteristics of foot-and-mouth (FMD) disease. It examines current measures being taken by the U.S. Department of Agriculture to prevent its importation, as well as economic and trade impacts of an outbreak. The report also raises issues concerning the adequacy of funding for disease exclusion and research.
- **Mad Cow Disease: Agriculture Issues (RS20839)**
This report describes Europe's measures to stop the spread of bovine spongiform encephalopathy (BSE), also known as "mad cow" disease. It examines actions that the U.S. Department of Agriculture (USDA) is taking to control known sources of outbreak risk and outlines the emergency response plan that USDA would implement if a case of BSE were confirmed within the United States.

GENERAL ACCOUNTING OFFICE

Copies of GAO Publications are available online at www.gao.gov or by calling 202/512-6000.

- **Medical Privacy Regulation: Questions Remain About Implementing the New Consent Requirement (GAO-01-584)**
This report examines the consent requirement in the recently instituted federal privacy regulations. Included is analysis of how the new consent requirement differs from the types of consent providers previously obtained from patients, as well as potential consequences for patients and providers.
- **Nuclear Nonproliferation: Security of Russia's Nuclear Material Improving; Further Enhancements Needed (GAO-01-312)**
This report assesses the Department of Energy's (DOE) Material Protection, Control, and Accounting program. The program is responsible for reducing the threat of theft within the Russian Nuclear program. The report examines the efficacy of the security systems proposed by DOE, as well as what DOE is doing to ensure that Russia operates and maintains the improved security systems over the long run.
- **Computer Security: Weaknesses Continue to Place Critical Federal Operations and Assets at Risk (GAO-01-600T)**
This testimony, given before the House Committee on Energy and Commerce, summarizes the results of GAO analysis of information security at 24 major federal departments and agencies. Topics covered include: the risks that weaknesses pose at selected individual agencies; the major common weaknesses that agencies must address; and management improvements that are needed to resolve these weaknesses.

THE NATIONAL ACADEMIES

Government offices may obtain single complimentary copies by calling the Office of Congressional and Government Affairs at 202/334-1513. Others may order copies from the National Academy Press (800/624-6242, www.nap.edu).

- **Musculoskeletal Disorders and the Workplace: Low Back and Upper Extremities (ISBN: 0-309-07284-0)**
This publication examines the scientific basis for connecting musculoskeletal disorders with the workplace. It presents the latest information on the prevalence, incidence, and costs of such disorders and identifies factors that influence injury reporting. It also assesses the effectiveness of various intervention strategies and recommends actions to be considered.
- **Under the Weather: Exploring the Linkages Among Climate, Ecosystem, and Infectious Disease (ISBN: 0-309-07278-6)**
This book evaluates our current understanding of the linkages among climate, ecosystems, and infectious disease; it then goes a step further and outlines the research needed to improve our understanding of these linkages. The book also examines the potential for using climate forecasts and ecological observations to help predict disease outbreaks.

scientific definitions

1. The act of making clear and distinct.
2. the act of stating a precise meaning or significance.

CLONING TERMS

BLASTOCYST The developing pre-implantation embryo, beginning about 4 days after fertilization. The blastocyst consists of a sphere of cells made up of an outer layer of support cells, a fluid-filled cavity, and a cluster of cells on the interior.

CELLULAR CLONING The process by which cells derived from the soma, or body, are grown in tissue culture in a laboratory. The genetic makeup of the resulting cloned cells, or cell line, is identical to that of the original cell.

CLONE A precise copy of a molecule, cell, or individual plant or animal.

DIPLOID A cell such as a somatic cell having two chromosome sets, as opposed to the haploid situation of eggs and sperm which have only one chromosome set.

DIFFERENTIATION The process whereby an unspecialized early embryonic cell acquires the features of a specialized cell such as a heart, liver, or muscle cell.

EMBRYO TRANSFER The introduction of a pre-implantation embryo into the uterus for growth and development.

ENUCLEATED CELL An egg from which the nucleus has been removed.

GAMETE A mature sperm or egg cell.

GERM CELL A sperm or egg (all other body cells are known as somatic cells).

MOLECULAR CLONING The process whereby identical fragments of DNA are produced by insertion of a DNA fragment into a host vector followed by amplification to produce many thousands of copies in a host cell, usually a bacterium.

NUCLEAR TRANSPLANTATION CLONING A type of cloning in which the nucleus from a diploid cell is fused with an egg from which the nucleus has been removed. The DNA of the transplanted nucleus thus directs the development of the ensuing embryo.

NUCLEUS The cell structure that houses the chromosomes, and thus the genes.

OOCYTE The mature female germ cell; the egg.

SOMATIC CELLS Any cell of an embryo, fetus, child, or adult not destined to become a sperm or egg cell.

SOURCE: *Cloning Human Beings: Report and Recommendations of the National Bioethics Advisory Committee*, June 1997, <http://bioethics.gov/pubs.html>

Space Station

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doing good science."

According to Rothenberg, NASA "continues to maximize research," aboard the space station. "We honestly believe the science community is our customer," he adds. Rothenberg also says that the list of cuts won't be finalized until June, and only after consultation with researchers.

Members of Congress were also upset by news of the overruns and were concerned about NASA's plans to address them. Reflecting on NASA's consistent history of cost problems, House Science Committee Chairman Sherwood Boehlert (R-NY) asked Goldin if "part of the uniform at NASA is a pair of rose-colored glasses." Boehlert also said that although Congress has historically supported the station, "This is not a case of unconditional love."

Rep. Sheila Jackson Lee (D-TX) said that she was "outraged that we are not going to have enough area to have six people," and Rep. Dana Rohrabacher (R-CA) informed Goldin that NASA was going to have to find alternate sources of funding than the "federal money truck." In response, Goldin said NASA "believes that there is considerable potential for instituting creative cost-cutting actions which streamline processes, focus resources, and leverage the strength of our international partners."

Although Goldin appeared candid with the committee, he repeatedly asked for the committee's patience regarding many of the specifics of NASA's redirection scheme. According to Goldin, NASA is currently in the midst of a "bottom-up" review, the results of which will be available sometime during the summer. At that time, Goldin promised to return to explain to the members its findings and NASA's future ISS plans. ●●●

FOR MORE INFORMATION:

International Space Station:
spaceflight.nasa.gov/station

Science Committee hearing:
www.house.gov/science/fchearings.htm

Human Cloning

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dom of scientific enquiry. The freedom to make personal reproduction choices."

Dr. Zavos announced in March that he along with Drs. Severino Antinori and Avi Ben-Abraham are conducting experiments in an undisclosed country with the goal of providing childless couples the ability to clone themselves as a form of reproduction. Dr. Antinori is known within the scientific community for utilizing *in vitro* fertilization to impregnate a 62 year-old woman. According to Dr. Zavos' testimony, the trio of scientists will maintain a safe approach to cloning by screening all embryos for genetic abnormalities. In addition, they plan to provide human cloning techniques strictly to infertile individuals that have no other option to reproduce. "[T]he Genie is out of her bottle," stated Zavos in interviews shortly after their initial public revelation.

Other scientists beg to differ. "Cloning as an approach to human assisted reproduction is at present both risky and extremely irresponsible," stated Dr. Mark Westhusian, a professor of veterinary medicine, in his written testimony. "Experiments from our laboratory and others provide strong evidence that the current procedures used for mammalian cloning are not safe and many times result in abnormal development. ...[R]egardless of the species, only 1%-5% of cloned embryos survive to term."

Dr. Rudolf Jaenisch, a professor of biology at the Massachusetts Institute of Technology, questioned Zavos' claim that they can screen for genetic abnormalities. He testified before the committee that "[t]here are no methods available now or in the foreseeable future to assess whether the genome of a cloned embryo has been correctly reprogrammed." He and Ian Wilmut wrote in *Science*, "There is every reason to think that the human cloning experiments

announced by P. Zavos and S. Antinori will have the same high failure rates as laboratories have experienced when attempting animal cloning."

Other witnesses expressed concern over the ethical issues posed by such an experiment as well as the social consequences. They argue that a dialogue needs to ensue first to address the social, ethical and legal considerations as well as to address the fundamental question of how to protect individuals and families from harm. This latter point raised the question of regulatory oversight, with varying interpretations. The Food and Drug Administration (FDA) claims jurisdiction over human cloning research under the auspices of the Public Health Service Act and the Federal Food, Drug, and Cosmetics Act because they maintain that somatic cell therapy products would fall under the category of biological products and drugs under each act.

Groups such as the Biotechnology Industry Organization (BIO) support FDA oversight and express confidence in its statutory authority. Some congressional lawmakers disagree. In his opening remarks, Energy and Commerce Chairman W.J. "Billy" Tauzin (R-LA) stated that "FDA's jurisdictional claim may suffer from being a 'square peg in a round hole.' ...[I] would not want to rely only on this single reed of federal regulation to address experiments intending to create a baby from cloning technology."

Other lawmakers are in agreement and to date, four bills have been introduced that would prohibit the cloning of a human being. Rep. Brian Kerns (R-IA) introduced the Ban on Human Cloning Act (H.R. 1260) on March 28. H.R. 1260 would impose a criminal penalty on any person that attempted to clone a human being with the intent of implantation. Rep. Cliff Stearns (R-FL) introduced the Human Cloning Research Pro-

hibition Act (H.R. 1372), which would prohibit the use of federal funds to conduct any research that "includes the use of human somatic cell nuclear transfer technology." The Stearns bill also requests that the National Research Council assess the impact of the Act on research after five years. Senator Ben Nighthorse Campbell (R-CO) introduced the Human Cloning Prohibition Act (S. 704) on April 5. S. 704 would impose both civil and criminal penalties on individuals engaged in a human cloning procedure and would make it illegal to utilize federal funds for that purpose. The most recent bill was introduced April 26 by Senator Sam Brownback (R-KS) and Rep. David Weldon (R-FL), and would impose both civil and criminal penalties on the creation of a human clone as well as the cloning of a human embryo.

Scientists are concerned that the flurry of legislative activity could lead to the unintended consequence of stifling research in other related fields such as therapeutic cloning which involves cloning specific cells, genes and tissues. They argue that legislation that is too broadly worded could make it illegal to conduct any experiment that utilizes somatic cell nuclear transfer, a technique that is common in other scientific areas. ●●●

FOR FURTHER INFORMATION:

House Committee on Energy and Commerce,
www.house.gov/commerce

"Don't Clone Humans!" Rudolf Jaenisch and Ian Wilmut, Science, 30 March 2001, vol. 291, www.sciencemag.org

National Bioethics Advisory Commission,
www.bioethics.gov

CLONAIID, www.clonaid.com

Human Cloning Foundation,
www.humancloning.org

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Heard off the Hill

Swarming Secrets • Scientists at the University of Oxford recently discovered an interesting secret behind locusts' tendency to swarm.

After noticing that the bugs

congregated more intensely as their numbers increased, researchers hypothesized that physical contact might be responsible. In a series of experiments, they used a fine brush to stimulate individual specimens and found that rubbing of the hind legs increased the gregarious urges of the agriculturally-unfriendly insects. Unfortunately, scientists have little insight on decreasing the locust's urge to swarm, a fact that might rub a few farmers the wrong way.

---> *The New York Times*, April 3, 2001

A Snapdragon By Any Other Name... • For the past 20 years, flowers have been genetically engineered for color, form, and shelf life. In the bargain, smell has taken a back seat. Scientists at Purdue University have now found 5 genes involved in producing over 1,000 aromatic floral chemicals, including those of *Antirrhinum majus*, the snapdragon. Although researchers have thus far been unable to produce hyper-aromatic progeny, they have successfully spliced the scented genes into floral genomes. Perhaps, in the future, one will be more inclined to stop and smell the snapdragons.

---> *Science*, February 9, 2001

Bitter is Better • A recent study conducted at the University of Miami suggests that our ability to differentiate between bitter tastes may be better than previously thought. Biologists Alejandro Caicedo and Stephen Roper used fluorescently dyed calcium – since taste receptor activation is accompanied by a rapid increase in calcium levels – to detect responses to five common bitter flavors. They found that specific taste cells were responsible for specific bitter flavors. The researchers say that this could be the reason that we are able to discern the difference between a bitter pill and a bitter beer. Here's to bitter being better.

---> *Science*, February 23, 2001

Computing with Light? • Fiber-optic cables are used around the world to speed up telecommunications. In fact, the conversion of electronic signals used by computers into light pulses that can travel along these glass fibers has enabled the growth of the Internet. However, physicists are working on a newer, even more powerful idea: an optical computer that relies on light and glass fibers for its processing, instead of electrical current and wires. Such a computer would not only be more compatible with a fiber-optic network, it would also be much faster itself. Now, researchers in Tsukuba, Japan, have brought this idea much closer to reality; they have constructed an optical version of a transistor, the basic building block of a computer, using laser beams.

---> *Nature Science Update*, April 25, 2001