US sequestration, shutdown cuts target scientific research

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In the years since World War II, US government funding of scientific research has supported tremendous advancements in human knowledge. The Internet, radar, the sequencing of the human genome, human space flight, and a myriad of health discoveries and treatments have been the results.

The web site of the National Institutes of Health (NIH) credits federally funded research for a large part of lengthening Americans' life expectancy, which has increased by nearly 30 years since 1900. Fundamental questions about our universe are being probed, with the expectation that the Laser Interferometer Gravitational Wave Observatory will detect gravitational waves—and challenge or confirm Einstein's theory of relativity—in the next few years.

Some of the cuts have resulted from deliberate attempts by right-wing elements like Senator Tom Coburn, Republican of Oklahoma, to legislate ignorance. At Coburn's instigation, the fiscal year 2013 omnibus spending bill included a stipulation that the National Science Foundation (NSF) stop funding political science research unless "projects are vital to national security or the economic interests of the country." NSF has since cancelled a regularly scheduled solicitation for political science proposals. Coburn has also weighed in on climate change, telling the Tulsa Regional Chamber of Commerce, "I am a global warming denier."

But the capitalist crisis, manifested in the government's budget crises, is causing the bulk of the cuts. The NIH, for example, lost $1.55 billion from its FY13 budget because of sequestration; moreover, it was forced to "apply the cut evenly across all programs, projects, and activities."

The National Aeronautics and Space Administration (NASA) reacted to the sequestration by prohibiting its employees from attending scientific conferences, and the prohibition was passed on to many contractors. Conferences, both in the US and internationally, are crucial opportunities for scientists to meet face-to-face with their colleagues to share and advance knowledge. NASA is now requiring staff to use "alternative methods" such as videoconferencing and prerecorded video messages.

Similarly, NASA cancelled most of its education and public outreach activities in response to the sequestration, depriving millions of students and workers. During the shutdown, NASA's web site is unavailable and its "For Students" page leads only to a general notice.

The NSF web site is also shuttered, and those of the Department of Energy and NIH are not being updated. During the shutdown, researchers are not able to submit proposals for future funding and no information is available on how proposal deadlines will be adjusted. Because a period of months is needed to review proposals after submittal, the awarding of new grants will be delayed next year, and possibly beyond.

Applications for astrophysics postdoctoral NSF fellowships were due this past week, but no information is available on when they can be submitted. Because of the sequestration, stipend levels for NIH postdoctoral fellows were not raised this year. The stipends were already inadequate for living expenses, starting at $39,264 for newly minted postdoctoral students and capped at $51,582 for those with six years of experience. Many postdocs already have families to support, and their research is often done in the most expensive areas of the country.

This summer, the American Society for Biochemistry and Molecular Biology (ASBMB) published a survey of 3,700 US researchers about their experience with

government funding. The respondents "spanned nearly all scientific fields including biology, chemistry, physics, geosciences, engineering, mathematics, economics, computer science, education, political science and social and behavioral sciences. "

Fifty-five percent of respondents had a colleague who either had lost his or her job or was about to; 46 percent of respondents had laid off scientific staff or "expected to soon"; 53 percent had been forced to turn down applications from "promising young researchers."

The ASBMB report documents the trend in federal research funding since 2002, with total purchasing power higher in that year than in 2013. Only 2 percent of the survey respondents reported receiving funds from their home institutions to make up for federal cuts, even though universities like Massachusetts Institute of Technology and Harvard are boasting double-digit endowment returns as stock prices soar.

NIH proposal success rates decreased from slightly more than 30 percent in 2002 to less than 20 percent in 2012. Even though the number of proposals submitted each year increased dramatically during that period, the number chosen for funding stayed either at or below 10,000.

The NIH web site gives examples of medical research that will be delayed because of the budget crises. Included are cancer drugs, a universal flu vaccine, and treatments for chronic illnesses that affect millions of people. It also states that the number of new patients admitted to the NIH Clinical Center will drop from 10,695 in 2012 to approximately 9,945 in 2013, with the qualification that "while much of this decrease is due to funding, clinical activity is always a dynamic situation with multiple drivers." The Centers for Disease Control has stopped its usual epidemiological tracking of flu cases.

Anecdotal evidence about the effects of the budget crises is also emerging. A September 9 report on the web site http://www.insidehighered.com gives the example of three labs forced to close at the University of Chicago's surgery department. The NIH was no longer able to provide $300,000 per year for research on renal ischemia. At the Harvard Medical School, a cardiovascular researcher had to lay off six of his ten staff because a grant was not renewed that "would have easily been funded under the levels of support previously available."

reddit thread for scientists has received nearly comments since the shutdown began. They include stories about federal technical officers who are surreptitiously working from home, without pay, to help grantees at universities and other institutions. Researchers whose work depends on studying animals in the field at certain times of the year will have to wait a year to conduct research interrupted by the shutdown, and proposal review panels—which require months of planning—will be disrupted.

The budget crises will cause damage to scientific knowledge for years to come, but US opinion-makers are most concerned about the exodus of trained researchers to other countries. A "fact sheet" on the web site of the Association of Public and Land-Grant Universities (APLU) complains of an American "innovation deficit," with detailed statistics about increases in China's research funding, the issuing of US patents to non-US entities, and the tripling of engineering doctorates awarded in China from 2000 to 2008.

On September 19, 14 heads of American industry associations—including the Association for Advancing Automation, the Council on Competitiveness, and the Solar Energy Industries Association—issued an open letter to Obama and the Congress, complaining that "America's competitiveness and future innovation capabilities cannot be held in limbo or sacrificed amidst the constantly changing, hypercompetitive global economy in which our member companies operate."

According to the APLU fact sheet, the average annual growth in Chinese R&D spending was more than 20 percent between 1996 and 2009. Coupled with the Obama administration's increasing military tensions with China, this competition is leading to crackdowns on the ability of Chinese researchers to study in the US.