

# Stalling science threatens every domain of modern life

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The looming "sequestration," across-the-board budget cuts that were never really meant to happen, could cripple key areas of science by slashing federal investment in research and development by an estimated 8.4 percent between now and 2017. That is not good for science, but it is also bad for an economy whose growth is driven by advances in science and technology.

At a time when federal R&D funding has already declined 10 percent in real dollars since 2010, indiscriminate spending cuts would further stall essential studies, with potential impacts on medical research, food safety, energy independence, national security, and efforts to come to grips with climate change. There are few aspects of modern life that are not touched by science, and the federal role in promoting innovative research across diverse fields must not be compromised.

Consider some of the benefits to date: NASA's many spinoff technologies have included a robotic arm that helps surgeons perform less-invasive surgeries, a device that stabilizes heart-transplant patients until a donor can be found, and sensors for detecting chemical warfare agents. Other federally funded research has given rise to the Google search engine, liquid-crystal displays, magnetic storage drives, and global positioning systems. The Human Genome Project, which cost the federal government \$3.8 billion between 1990 and 2003, or \$5.6 billion in 2010 dollars, has generated an economic payoff of \$796 billion, according to a study by Battelle Memorial Institute. Advances resulting from the project have encompassed human health, agriculture, forensics, veterinary medicine, and more.

If broad-axe budget cuts happen, few research fields will remain unscathed. Vital projects related to cancer, cyber security, weather-monitoring, and other national concerns would be endangered as federal agencies scramble to reduce or terminate programs, cut overhead costs, and slash capital spending. States that receive federal R&D money would feel the pain. California could lose \$7.3 billion in reduced R&D funding from the Defense Department alone over the next five years and \$11.3 billion overall. Texas could lose \$2.8 billion overall, Florida \$1.6 billion and Washington \$1.7 billion.

Slowing scientific progress seems a particularly bad idea for the United States at the same time that other countries are rapidly increasing their R&D investments. Since 1999, China's support for science, for example, has grown 10 times faster, as a percentage of its economy, or gross domestic product, compared with the United States. We also now invest a smaller share of our economy on R&D than Japan, Germany, South Korea, Taiwan, Israel, and Finland.

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The pending sequestration, mandating nearly \$1 trillion in indiscriminate spending cuts over the next decade, would cut defense R&D by 9.1 percent and nondefense R&D by 7.4 percent over the first five years, assuming budget reductions are distributed equally. This slash-and-burn approach to trimming the federal deficit was originally intended only as a worst-case or default position. While many Republican and Democrats alike fear the "fiscal cliff" that looms, continuing political inaction will make it a reality.

The Budget Control Act, signed into law in August 2011, set forth a two-step process for trimming the nation's \$1.1 trillion annual deficit. A supercommittee's failure to agree on a deficit-reduction plan launched the countdown to a second, emergency stop-gap measure: automatic sequestration. Sweeping budget cuts will go into effect in January unless Congress takes action during the upcoming lame-duck session.

A new analysis by the American Association for the Advancement of Science looked at two possible sequestration scenarios being discussed on Capitol Hill: Cuts to nondefense research areas only or cuts affecting science programs in both defense and nondefense agencies. If the cuts are unbalanced, with lawmakers declining trims to defense spending and shifting them to nondefense programs, some civilian agencies could lose up to up to 17.5% of their R&D funding by 2017, the analysis found. The National Institutes of Health, for example, would lose \$26.1 billion over five years rather than \$11.3 billion under an equal-distribution scenario.

Of great concern is the likelihood that drastic cuts to science, particularly over a ten-year period, would further discourage a group of potential young innovators who already face profound challenges. Tight budgets mean longer intervals between graduate school and the first research grant (generally viewed as the measure of when a scientist's career starts). The graying of grantees for the National Institutes of Health already is well underway. In 1980, researchers got a first NIH grant at an average age of 36. By 2008, the average age was 42, according to a study published last year.

Yes, budget cuts seem necessary and unavoidable. But deficit reduction must be wise. Applying sequestration as a blunt fiscal instrument would have dramatic and long-lasting consequences for the U.S. research effort. If the nation is to remain a global leader in the kinds of innovation that fuel economic progress and job growth, Congress and the President must work together to protect the federal investment in science and technology.

## ABOUT THE WRITERS

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