

of research universities that have held votes to unionize since last year's NLRB decision. At Duke University, graduate students voted down unionization. Votes at Harvard and Cornell remain too close to call. Columbia graduate assistants voted by more than a two-to-one margin to unionize. And at Yale, where union votes were held by department, eight, including math and geophysics, voted to unionize. One—physics—voted against. Several other departments didn't vote.

Yet even at schools where union supporters scored victories, students are barely closer to a labor contract than they were a year ago. Like Yale, Columbia is appealing the legality of its vote, alleging voter intimidation by union supporters. Although an NLRB hearing officer has recommended that that school's objections be overruled, university officials have signaled that they won't enter labor negotiations until their appeal is for-

mally settled. Yale officials, who are questioning the legality of a department-by-department rather than campus-wide vote, have done likewise.

Waiting for Trump?

Administrators at Columbia and Yale say they're simply allowing the legal process to play out, but union advocates suspect an ulterior motive behind the appeals. NLRB rulings on student labor rights have historically flip-flopped along party lines, and President Trump is widely expected to staff the NLRB with members who'll reverse last year's Obama-era decision. If universities haven't signed onto a union contract by then, they may not have to.

That's why Canavan and her Local 33 colleagues felt they had little choice but to stage a hunger strike. On 25 April they erected and occupied a makeshift encampment in Beinecke Plaza, outside the

office of Yale's president. After 10 days of consuming only water, Canavan's health deteriorated, and fellow geophysics student Sarah Arveson took her place in the fast. A week and a half later, Arveson was hospitalized with dehydration.

On 22 May, the day of Yale's commencement ceremony, Local 33 ended the hunger strike, despite the university's continued holdout against negotiations. "We decided that because commencement is the beginning of a new thing, it was a meaningful way to end the fast," says Canavan. Three days later the university dismantled and removed the Beinecke Plaza encampment, still occupied at the time by three graduate students.

Through it all, Canavan says her and her colleagues' resolve to bring university officials to the negotiating table is none the weaker: "We are going to hold them accountable."

Ashley G. Smart

Grim news for science and research in Trump budget

Across-the-board cuts to civilian R&D programs would help pay for increased defense spending, but they face an uncertain future in Congress.

President Trump in his budget for fiscal year 2018 proposes the biggest cuts to federal nondefense R&D spending of any administration in a generation, even surpassing President Ronald Reagan, who came the closest more than 30 years ago. According to estimates by the American Association for the Advancement of Science (AAAS), federal support for R&D would tumble 16.8%, or \$12.6 billion, from its current-year level, with disproportionately larger cuts to the National Institutes of Health and the research programs of the Environmental Protection Agency and the National Oceanic and Atmospheric Administration. NSF would be hit with an 11% reduction from its FY 2017 funding level.

Delivered to Congress on 23 May, Trump's budget proposal adheres closely to the skeletal framework the White House released in March. Although any president's budget in recent years is routinely declared "dead on arrival" by a large fraction of lawmakers, Trump's request is certain to be significantly altered, if not largely ignored, by

Congress. Members previously indicated their distaste for big reductions in R&D spending when they ignored Trump's request for deep cuts in the omnibus FY 2017 appropriations bill. Instead, they added substantially to NIH's budget, slightly increased funding for the Department of Energy's Office of Science, and upped NASA's science programs 3%, among other provisions.

According to an analysis of AAAS data by PHYSICS TODAY, since 1996 the difference between what the president has proposed for nondefense R&D and what Congress has appropriated has never varied by more than \$5 billion. In 2011 Congress allocated \$5 billion more than President Barack Obama had requested in his budget, and in 2017 it apportioned \$5 billion less than Obama's proposal. Over the same period, the variation has been somewhat greater for defense R&D, where appropriations ranged from \$7.8 billion below Obama's request in 2013 to \$6.4 billion above that submitted by President Bill Clinton in 2000.

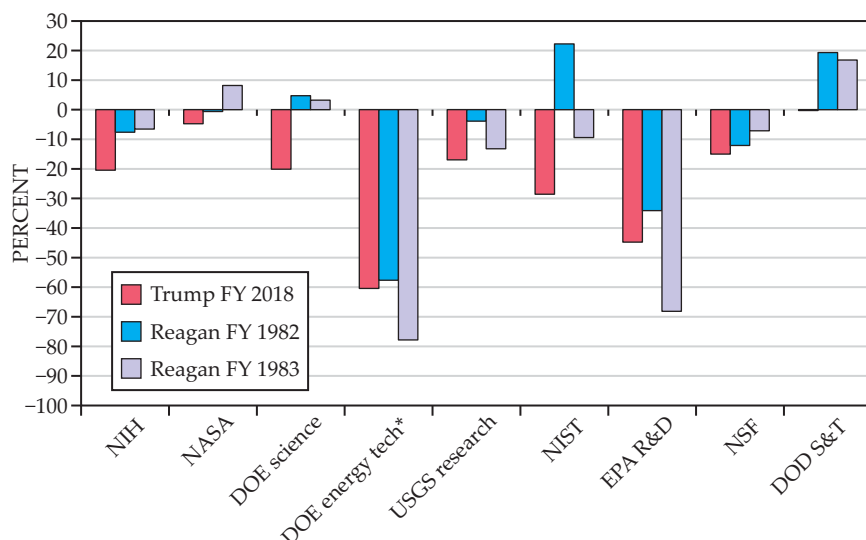
The administration's overarching mo-

tivation for the proposed reductions is to transfer \$54 billion in nondefense discretionary funding to pay for a defense buildup. But the Bipartisan Budget Act of 2015 presents a significant impediment. That law established separate, binding caps for defense and nondefense discretionary spending that will have to be breached if the transfer is to occur. Should the House of Representatives agree to revisit the spending caps, changes would require a 60-vote margin in the Senate, where Republicans hold only a two-seat majority.

NIH an unlikely target

Among Trump's proposed R&D cuts, none are less likely to survive than those for NIH, which has enjoyed staunch bipartisan support for decades. As pundits have repeatedly pointed out, the desire for longer, disease-free lives crosses party lines. Congress added \$2 billion for NIH this year, a 6.2% increase, bringing its budget to \$33.3 billion. Trump now proposes to cut NIH funding by 22%, or more than \$7 billion, in FY 2018.

The DOE Office of Science, which funds basic research in the physical sciences, received a 1% increase for FY 2017. The office would get a 17%, or \$847 mil-



PRESIDENT RONALD REAGAN came the closest of any US president to proposing R&D spending cuts of the magnitude that the Trump administration is requesting for fiscal year 2018. Estimates are based on FY 2018 budget figures and historical budget documents, analyses, and reports from the American Association for the Advancement of Science. (* DOE energy tech includes energy efficiency and renewable energy, fossil energy, and nuclear energy.)

lion, cut next year under Trump's plan. But DOE's basic research programs have been long watched over by key Republican lawmakers such as House Appropriations Committee chairman Rodney Frelinghuysen (NJ) and Senator Lamar Alexander (TN), who chairs the appropriations subcommittee that has jurisdiction over DOE. Alexander has been an ardent supporter of the Advanced Research Projects Agency-Energy at DOE, which Trump has targeted for elimination next year. Lawmakers upped its budget by 5% this year.

In a statement released when the budget was announced, Alexander said, "We should not pretend to balance the budget by cutting national laboratories, national parks, and the National Institutes of Health."

Basic energy sciences, the largest of the Office of Science divisions, would see its budget decline 16%, or \$295 million. Fusion energy sciences would face a cut of 28%, to \$330 million. Funding for ITER, the international fusion test reactor, would be reduced to \$63 million from \$100 million. The DOE budget includes \$120 million to restart the preparation process for a proposed high-level nuclear waste repository at Yucca Mountain in Nevada. Obama terminated the project soon after taking office.

The biggest reduction at DOE, in percentage and dollar terms, would be to

energy efficiency and renewable energy, where spending would plunge 70%, or \$1.4 billion, to \$636 million. Those cuts are more likely to be entertained by Republican lawmakers, many of whom see those programs as work that should be performed by the private sector.

The EPA's science and technology programs would be cut 47%, to \$264 million. "What I think you saw happen during the previous administration was the pendulum went too far to one side, spending too much of your money on climate change, and not very efficiently," Office of Management and Budget director Mick Mulvaney told reporters at a budget briefing. "We don't get rid of it here. Do we target it? Sure. Do a lot of the EPA reductions aim at reducing the focus on climate science? Yes. Does it mean we are antisience? Absolutely not. We are simply trying to get things back in order."

The sole increase in R&D in the Trump budget is for defense, for which funding would jump 13%, or \$11 billion, to \$83.3 billion. Nearly all of that increase is for development of specific weapons systems. Basic defense research would be flat at \$2.2 billion.

Historical R&D

Reagan succeeded in getting a good part of his R&D reductions enacted in the initial years of his presidency (see the figure). As tabulated by AAAS, nondefense

R&D spending declined from \$42.8 billion in FY 1981, the last year of the Carter administration, to \$30.2 billion in FY 1983, followed by a gradual recovery to \$39.6 billion in FY 1989, Reagan's last budget (comparisons here are in constant 2016 dollars). The Reagan cuts reflected steep reductions to Carter-era energy research programs and a redirection of R&D into military research. Non-defense R&D rose steadily during the George H. W. Bush administration and in the early years of the Clinton administration; it reached \$49.8 billion in 1994.

Federal nondefense R&D spending surged during the George W. Bush years to \$70.3 billion in FY 2003, helped by a five-year doubling of the NIH budget. Nondefense R&D declined slightly during the remaining Bush years to \$67.3 billion as NIH funding leveled off and began a steady decline in real terms, and a deliberate effort to double physical sciences research at DOE, NIST, and NSF fell short. With the exception of the one-time shot of \$20.9 billion in economic stimulus funding in FY 2009, statutory spending caps restricted Obama to mostly inflationary increases.

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