# Government shutdowns hamper progress in materials research

Governments across the globe fund science to build an edge in innovation and technology, which pushes the boundaries of human knowledge, enables economic growth, and provides national security. So what happens to science when governments shut down? Following the most recent partial government shutdown in the United States that spanned between December 21, 2018 and January 25, 2019, the impacts are still being determined. For science, this question does not have a single, simple answer because it depends on the duration of the shutdown, the parts of the government impacted, and even the timing of the shutdown. But one thing is for sure—government shutdowns aren't good for science.

During the 34-day shutdown—the longest in US history—many researchers and scientific societies called on the government to find a solution. David Norton, vice president for Research at the University of Florida and the chair of the Materials Research Society (MRS) Government Affairs Committee, wrote an opinion piece that was published in the *Tampa Bay Times* about the impacts of the shutdown on science. "In research and innovation, time to success is often the difference between leading the world or being just another also-ran. Each day of the shutdown eats away at our competitiveness as institutions and as a nation," Norton wrote. MRS also took action through its Materials Voice letter campaign to the US Congress and the White House. The letter called for a bipartisan solution to resolve the shutdown, stating "The damaging effects of the shutdown on science are more subtle than airline safety or food inspections, but they are long lasting and irreversible. It will take years, if ever, for the scientific community to recover from this funding lapse."

Following the shutdown, Norton cited the "missed opportunities to get new [funding] proposals reviewed and approved" across a number of government agencies as one of the most damaging long-term impacts of the shutdown on science. Damon Dozier, MRS Director of Government Affairs agreed and pointed out that in addition to the halt in many important agency activities, the record-breaking length of the shutdown translated to significant financial uncertainty for a large number of individual researchers. Norton also addressed the impact to individual scientists, and the possible repercussions to science- and research-based government agencies, saying, "The financial hardship on affected government employees has to give some young professionals pause when considering such a position as a career move."

In addition, the government shutdown meant hundreds of government scientists missed conferences, like that of the American Astronomical Society, which was held in Seattle during the shutdown. Although the most recent shutdown did not impact the MRS conferences, MRS Director of Meetings Patricia Hastings says that federal employees make up "roughly 8% of attendees between [MRS] Spring and Fall [Meetings]," and provided some insight into the possible impacts of a future shutdown.

According to Hastings, "If we are three or four months out, and there's a shutdown, this could affect visa processing for international visitors via the State Department," which she says would result in cancellations. Hastings adds that if the shutdown

**Table I: Funding gaps of the modern US budget process.**

| Fiscal Year | President | Length* | Shutdown |
|---|---|---|---|
| 1977 | Ford | 10 days | No |
| 1978 | Carter | 12 days | No |
| 1978 | Carter | 8 days | No |
| 1978 | Carter | 8 days | No |
| 1979 | Carter | 17 days | No |
| 1980 | Carter | 11 days | No |
| 1982 | Reagan | 2 days | Yes - partial |
| 1983 | Reagan | 1 day | No |
| 1983 | Reagan | 3 days | No |
| 1984 | Reagan | 3 days | No |
| 1985 | Reagan | 2 days | No |
| 1985 | Reagan | 1 day | Yes – partial |
| 1987 | Reagan | 1 day | Yes – partial |
| 1988 | Reagan | 1 day | No |
| 1991 | Bush | 3 days | Yes – partial |
| 1996 | Clinton | 5 days | Yes – partial (3/13 already passed) |
| 1996 | Clinton | 21 days | Yes – partial (7/13 already passed) |
| 2014 | Obama | 16 days | Yes – full |
| 2018 | Trump | 2 days | Yes – full |
| 2019 | Trump | 34 days | Yes – partial (5/12 already passed) |

Source: CRS data

* CRS calculated the length of funding lapses based on the total number of full days for which there was no budget authority. For example, for the latest shutdown, budget authority expired at the end of the day on December 21, 2018, and new budget authority was enacted on January 25, 2019, yielding a funding gap of 34 full days.

Tan highlighting indicates funding gaps prior to the Civiletti opinion letters for which there was no government shutdown regardless of the length of funding lapse.

happened just weeks before (or during) a conference, "there would be a number of cancellations of talks from government agency [and laboratory] authors," and organizers would "have to start juggling their programs nimbly when cancellations and withdrawals start coming in." This could include asking nongovernment co-authors to present for their government colleagues, filling canceled timeslots with discussions, or changing a poster presentation to an oral one. In addition, any government-specific sessions—such as those on government agency funding—would likely be canceled assuming the speakers were among those furloughed. Although a shutdown would cause "a noticeable gap" for a MRS Conference, Hastings points out that with between 4000 and 6000 papers presented at every conference, a shutdown would not be "a make or break event" for MRS or for nongovernment attendees.

But Hastings raises one further question that does not have a clear answer: How might universities, or even specific projects, that are funded on government grants from shutdown agencies react? Would they still send attendees to a conference as planned, or end up canceling their attendance? It is likely that different institutions would answer this question in different ways based on a number of factors including their financial obligations, partnerships, and expectations of a return to normalcy following a shutdown. Regardless, meetings and conferences provide important opportunities for scientists and researchers to share research outcomes, set up new collaborations, and formulate innovative ideas to push the boundaries of science and technology. And when federal scientists—and nongovernment researchers supported by federal grants—miss out on these opportunities, it sets back the scientific enterprise.

What is the likelihood of another US government shutdown occurring? To answer this question, it is important to both understand the normal budget process and look at the history of funding lapses and government shutdowns.

The modern US budget process was defined in the Congressional Budget Act of 1974, and begins with the annual submission of the president's budget request to Congress (generally in February or March). Congress is then responsible for passing 12 appropriations bills that together make up all discretionary government spending. The budget process is completed when each of the 12 appropriations bills is passed and becomes law prior to October 1, the beginning of the new fiscal year (FY).

While this process may be likened to a "standard operating procedure" for keeping the government funded and running, its completion in time has become increasingly rare. Partisan politics, differing priorities, and government dysfunction have led to an increase in continuing resolutions (CR—an extension of the previous FY's budget), funding gaps, and government shutdowns. "One of the biggest impacts on the scientific enterprise when Congress fails to pass budgets in regular order is the overall uncertainty it creates in terms of funding and funding opportunities," Dozier says. This has a negative impact on science because "historically, agencies have been reluctant to either issue new solicitations or make plans to invest in emerging areas during times of budget uncertainty or lapses in funding."

According to the Congressional Research Service (CRS), 20 funding gaps have occurred since the modernization of the budget process in 1977 (see Table I). Not all funding gaps have led to government shutdowns, and in some cases the shutdown has been partial, which means some of the appropriations bills have already become law and only the unfunded parts of the government enter shutdown. Until FY 1981, the government continued to operate during periods of expired funding until then-Attorney General Benjamin Civiletti issued opinion letters that stated that federal government activities should be limited to only essential activities in the event of a lapse in appropriated funding (based on the Antideficiency Act). The duration of the funding gaps for the decade following the issuance of Civiletti's opinions (FY 1982–FY 1991) shrunk to an average of less than two days, and many of these resulted in no shutdown of activities or employee furlough because they occurred over weekends or holidays.

But according to the CRS data, the duration and severity of funding lapses have both increased significantly in recent history. The longest prior shutdown lasted 21 days—nearly an entire two weeks less than the latest shutdown. And while both the threat and the actual act of forcing a government shutdown through a funding lapse have long been used as political bargaining chips, the full effects of the trend toward longer shutdowns that impact more government agencies and employees have only begun to be realized.

Taking into account both the trends in funding lapses and the current highly partisan political climate, it seems likely that another government shutdown may be looming as early as the next budget cycle. However, other factors may play a role in keeping the government up and running. The latest shutdown was highly unpopular across the United States, which could translate to politicians trying to avoid a future shutdown to salvage popularity for future election cycles. In addition, Congress has previously considered (but never passed) proposals to establish an automatic continuing resolution (ACR), which would provide sustained funding if the appropriations process is not completed. "Although we have seen a couple of these ACR bills introduced this Congress, none have moved to date" Dozier says, who acknowledged that movement of a ACR bill is a possibility that might become more likely if the FY 2020 appropriation cycle stalls and/or leads to another government shutdown.

While the government is funded through FY 2019, the impacts of the recent shutdown are still rippling through the United States. Adding the fact that the 116th Congress is divided (Democrats control the House while Republicans control the Senate and White House), it is impossible to predict whether another government shutdown is just over the horizon in FY 2020. But there is something that materials researchers and scientists can do—the community needs to "develop relationships year-round with Congressional staff," Dozier says. Norton agrees and takes it a step further saying scientists must "make clear to their representatives in Congress the importance of uninterrupted basic research [for] the future of our nation."

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