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Effects on Science & Technology Amidst Government Shutdown

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I. Executive Summary

November has seen the longest government shutdown in U.S. history, beginning on October 1, 2025 and lasting for 43 days. This shutdown posed major disruptions for the science and technology sector. The abrupt halt in federal funding for essential basic and applied research stagnated U.S. global competitiveness as agencies will require months to regain lost progress. Additionally, it adds to the pressure already faced by federal agencies such as the Centers for Disease Control (CDC) from mass layoffs earlier in the year. Policymakers in the Bureau of Labor Statistics who depend on timely information to inform their decisions will also experience greater difficulty due to furlough. Furthermore, pathways for young people to enter STEM careers such as the NASA Office of STEM Engagement (OSTEM) have been impaired because of the shutdown. Because of this, many scientific societies and agencies such as The Science Coalition are pushing for more predictable funding and assurance for long-term projects that could be compromised by funding disruptions.

II. Relevance

Government shutdowns pose significant challenges to the U.S. scientific and policymaking community as they severely limit the operations of federal agencies that fund, research, and implement public policy. Many of America's STEM institutions rely on government funding and approval to conduct research, including both basic (done in core STEM fields to further our knowledge of the field itself) and applied research (real-world applications of STEM). During prolonged shutdowns, an estimated 40% of federally funded research projects experience interruptions, and the U.S. inevitably risks losing critical momentum in fields that depend on long-term experimentation and investment (American Association for the Advancement of Science).

III. History

A government shutdown occurs when Congress fails to pass appropriations legislation or a continuing resolution to fund federal operations before the start of the fiscal year, triggering the Antideficiency Act (31 U.S.C. §§ 1341 et seq.). The Antideficiency Act prevents the spending of government funds not yet appropriated by Congress, upholding Congress's "power of the purse." All but essential personnel who are forced to work without pay are to be furloughed, which means they are temporarily suspended or discharged from their job.

The first-ever government shutdown took place in 1981 during the Reagan administration after the president vetoed a proposed appropriations bill. The recent government shutdown lasted for 43 days from October to November 2025, breaking the record of 35 days set in 2019 in President Trump's first term.

The shutdown was caused by debates over the inclusion of the Affordable Care Act (ACA) health care tax credits in appropriations legislation for the 2026 fiscal year. The Affordable Care Act is a 2010 U.S. reform law that expands access to affordable healthcare services and Medicaid, which over 22 million Americans rely on for health insurance. On the one hand, Democrats wanted an extension for these expiring subsidies, asserting that expanding the government's role in providing access to health care follows the party's general moral stance that healthcare is a human right regardless of income level. However, Republicans refused to negotiate the extension within this bill as they considered it to be a separate policy issue. The party, supported by President Donald Trump, argued that subsidies are wasteful as they channel money to insurance companies instead of consumers.

Ironically, the policy dispute led to a shutdown that froze numerous essential government programs such as the Supplemental Nutrition Assistance Program (SNAP), scientific grants, and national parks. Agencies can spend days preparing for a shutdown, working on winding down operations and freezing facilities and contracts, and contractors increase their contracts under the constant risk of disruptions to government-allocated funds. This trickles down the line to harm the economy and cost taxpayers, with the potential to reduce national GDP growth by billions per week.

IV. Notable Stakeholders

- Federal Workforce: Federal employees at research agencies are directly affected by government shutdowns with many workers in nonessential roles receiving furlough notices. For instance, the Department of Energy reduced $7.6 billion across 223 research projects including $620 million allocated to universities, putting scientific positions and long-term research at risk. Other major agencies have also halted grant reviews, suspended projects, or cut funding. Past shutdowns depict the overall workforce consequences: during the 2018–19 shutdown, furloughs led to a 19% increase in federal employee separations, with employees under 10 years of service experiencing a 22% rise in quitting and a 48% rise in firings. These measures left many scientists and administrators idle for the duration of the shutdown, contributing to increased workforce turnover and lowered morale.
- Public Health Data and Community Impact: NHANES, Maternal Health, and NOAA Research. Notably, around 1,300 staff members at the CDC received furlough notices during the 2025 shutdown including employees working on the National Health and Nutrition Examination Survey (NHANES) and maternal health tracking programs. These agencies are essential to the nation's health and nutrition research enterprise. The data collected through various research and surveys are the cornerstone of the public health infrastructure and are necessary for nutrition and health research, policy, and programs. The layoffs threaten not only the staff but the nation's ability to monitor and understand critical health and nutrition trends. Both programs were paused in the face of the shutdown, threatening public health monitoring nationwide since NHANES supplies the nation's core health statistics, and the maternal health program tracks risks like mortality and pregnancy complications. Likewise, the effect of halting NOAA laboratories disrupted environmental monitoring and climate research. Communities that depend on timely climate, energy, or public-health research from NOAA-funded labs face delays in research and depict how shutdowns ripple outward, affecting both the workforce and communities that rely on scientific data for health.

V. Impact on Young People

Young people pursuing STEM branches are among those impacted by government shutdowns. Many federal agencies that traditionally host internships and fellowships such as NASA and the National Institute of Health were unable to onboard students during the shutdown. These programs are often invaluable, formative experiences that provide lab exposure and networks of mentors and alumni. When these entry points disappear, youth, especially those without preexisting connections in STEM fields, lose critical opportunities to explore careers and build competitive resumes (American Society for Engineering Education).

College students and early-career researchers have also experienced disruptions with long-term academic and professional consequences. Undergraduates working on federally funded research projects often rely on stipends administered through agencies. During shutdowns, many of these payments are delayed. In addition, grant approvals and project renewals stall, which slows or fully stops ongoing research.

Those not directly engaging in research are also negatively affected. For those interested in post-graduate studies and opportunities applying to graduate school or national fellowships, gaps in research progress can correlate with weaker applications (Baker Institute). These setbacks accumulate, potentially discouraging otherwise-promising students from continuing education.

Federal educational technology initiatives, including the Department of Education STEM grants and digital equity programs, were postponed or frozen (U.S. Department of Education) during the shutdown. STEM grants often fund research on effective STEM teaching and learning, after-school enrichment programs, and partnerships bringing hands-on STEM experiences to underrepresented students. Digital equity programs work to close the digital divide, which is the gap in access to reliable internet and devices, by helping schools support implementation.

First-generation and low-income students, who rely more heavily on publicly funded opportunities to access high-quality STEM resources, were also disproportionately affected. Need-based financial support increases the likelihood that low-income students major in STEM (The HOPE Center). This shows the critical role of funding in enabling equitable participation in STEM pathways and how the shutdown exacerbated existing gaps in education access.

VI. Conclusion

The 2025 shutdown is evidence that the U.S. scientific capacity is vulnerable to political gridlock and cannot continue operating without structural protections against lapses in federal funding. During the 2025 shutdown, major science agencies were forced to halt or significantly scale back operations. These disruptions in research relating to health, climate, energy, and numerous other sectors, demonstrate that the nation's scientific backbone is not sustainable in the face of congressional paralysis.

Moving forward, both policymakers and the public should recognize that scientific shutdowns extend beyond just temporary delays, causing long-term disruptions to research, public health programs, and

national scientific capacity. Shutdowns don't just operate with brief pauses and resumes – they disrupt projects, derail time-sensitive fieldwork, and weaken the workforce, as seen in past shutdowns. A past shutdown that presents this clearly is the 2018-19 shutdown that increased federal employee turnover and lowered morale, especially in agencies with high furlough rates.

Congress must consider how to prevent these disruptions in case of another shutdown from happening again, especially since agencies such as the National Science Foundation (NSF) have already acknowledged that most internal research would have to pause during any future lapse, stating only a small group of "excepted" employees would continue working while most internal research activities would be halted. Thus, ensuring reliable federal support for scientific research is essential if the United States continues to have government shutdowns in the near future.