I'm an award-winning mathematician. Trump just cut my funding.

The "Mozart of Math" tried to stay out of politics. Then it came for his research.

HOME OF THE BRAVE
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By Terence Tao

In just six months, the United States has seen a wholesale assault on the scientific infrastructure that helped make it a world leader in innovation. Grants have been cancelled mid-project, fellowships for the next generation of researchers gutted, and federally funded institutes stripped of the resources they need to operate. These decisions are not the result of scientific review or Congressional debate, but of abrupt political directives that bypass long-standing norms, disrupt multi-year projects, and erode the independence of our research ecosystem.

I speak to this not as a distant observer, but as someone whose entire professional life has been shaped by that ecosystem. I grew up in Australia, but was immersed in American science and culture from an early age. Sesame Street taught me to count; Carl Sagan's Cosmos inspired a fascination with the natural world; and books from the Mathematical Association of America deepened my love of mathematics. My path eventually led me from undergraduate study in Australia to graduate school at Princeton on a Fulbright fellowship, and later to a postdoctoral position at UCLA, where I have now taught and mentored students and conducted research for over 25 years.

In that time, I have seen first-hand how sustained federal investment—channeled through agencies like the National Science Foundation (NSF)—powers the collaborations that link universities, government laboratories, and industry. At UCLA's Institute for Pure and Applied Mathematics (IPAM), where I now serve as Director of Special Projects, those collaborations have laid the groundwork for both theoretical breakthroughs and practical technologies. My own research at IPAM, for instance, helped lead to the algorithms that now cut MRI scan times by a factor of up to 10. This is the America I chose as my adoptive home: a place where science is valued as a public good, and where researchers from around the world come to contribute their ideas and energy.

For over seven decades, the US has become accustomed to the status of being a superpower in STEM (science, technology, engineering, and mathematics), with many of the world's most talented minds choosing to study, work in, and in many cases emigrate to, this country. In some cases, they are leaving a home undergoing war or political upheaval; but for many (myself included), they simply are attracted to the vibrancy, stability, and resourcefulness of the US research environment, and all the opportunities that it generates.

Because of this, the US has been the source of many of the modern world's scientific breakthroughs and technological advances, with Americans often among the first to gain access to new ways to communicate, treat diseases, improve energy efficiency, or simply have a more comfortable life. Mathematics—my own field—plays a quiet but crucial role in this process, being the common language that connects all the sciences together, and enabling the modeling of even quite complex systems with high accuracy.

Not every scientific experiment leads to a successful discovery, not every model prediction matches reality precisely, and not every theoretical line of inquiry leads to a tangible practical application. But this risk of failure (or at least of a negative result) is an inherent part of the scientific process, and it is far better to identify both the positive and negative outcomes of a technology in a laboratory, computer simulation, or even on pen and paper, than in a disastrous real-world deployment.

While external events, such as the exodus of scientists from Nazi Germany or the former Soviet Union, have certainly contributed to US scientific dominance, an equally important role has been played by the sustained bipartisan investment from the federal government in basic science as a public good, as exemplified by the founding of the National Science Foundation (NSF) in 1950. Over the years, a successful formula was developed and refined: Public and private universities would employ academics to teach and conduct research. The federal science agencies would—guided primarily by scientific evaluations of proposals—award grants to support these academics (and also government scientists) in contributing to the scientific research commons, as well as to train the next generation of scientists. And the private sector would invest in research and development to translate these scientific developments into commercializable applications.

Successive administrations or Congress might make adjustments to the funding levels or priorities of the federal component of this scientific infrastructure; but there was consensus that any such changes should be implemented at a deliberate pace and with all the due process of law, to minimize unnecessary disruption and allow for predictable long-term planning and budgeting, for instance with regards to the hiring students and researchers for multi-year projects. Furthermore, while policymakers could set broad goals and targets, it was widely accepted that expert peer review, rather than the opinions or beliefs of political appointees without the appropriate scientific background, should be the primary guide for how resources should be allocated to achieve those goals. This is the successful and healthy research ecosystem that I have spent my professional career in, whether it was as a (successful or unsuccessful) applicant of a federal grant, a participant in a program run by a federally funded institute, a grant reviewer for a proposal by a scientific colleague, or as a member of the President's Council of Advisors on Science and Technology during the Biden administration.

It is therefore stunning and devastating to discover that the new administration, in just its first six months, has deliberately attacked and weakened almost all the supporting pillars of this ecosystem. Executive actions have cancelled or suspended federal grants with unprecedented scale and speed, with billions of dollars worth of ongoing research projects and experiments disrupted. This is not because of a negative scientific assessment of the work, but instead by seemingly arbitrary justifications. Critical funding has been pulled for as insignificant a reason as the presence of a key word in the original proposal that is retroactively deemed unacceptable.

These federal actions have often been enacted without the usual components of due process, such as the right to respond to any allegations of misconduct. The full power of the federal government is used to coerce universities to change their internal policies to align with the administration's priorities, in flagrant violation of the long-standing US traditions of limited government and private freedoms. Public scientific datasets and resources are quietly disappearing from the websites of federal science agencies, often without any justification provided. Additionally, shifts in federal immigration policy have resulted in foreign scientists studying or working in the US finding it increasingly difficult to renew their visas, re-enter the country, or in some cases to just do their job without being investigated by authorities. This is not a routine policy shift—it is a deliberate dismantling of the institutions, funding, and freedoms that have sustained American science for generations.

UCLA has already been hit hard by the cumulative impact of these actions, though it is far from alone in this regard. The NSF has dramatically cut back many of the key scholarships and fellowships intended to train and motivate the next generation of leading scientists, depriving many students and postdocs of valuable early career opportunities that were available to previous generations. Grants that had already been approved and were in the process of disbursing funds to operate projects and employ students and researchers have had this funding abruptly delayed or suspended. In some cases, swift legal action has led to a partial restoration of this support by court order; but the disruption can still lead to critical gaps in data collection or contact with research subjects.

My personal research grant, which is used to support the research and travel of my graduate students, as well as fund one month of my own research during the summer quarter, was among the grants suspended in the most recent action against UCLA; I had managed to prioritize the summer funding of my own graduate students to shield them from immediate impact, but am still awaiting my own salary for the research I have already conducted. But far more significant than this was the existential threat to IPAM, which had recently received preliminary approval from the NSF for a five-year extension of its grant, which it was relying on to continue operating its scheduled programs and workshops for the upcoming academic year, only to have its entire access to funding (including carryover unspent funds from its previous grant) suddenly cut off. Through the heroic emergency fundraising efforts of the directors and staff at the institute in the last few weeks, and some generous and prompt donations from private individuals, we have been able to stave off immediate disaster and maintain scheduled operations until the end of the calendar year at least; but this is no way to run a world-class scientific institution.

Federal support is, of course, a privilege, not a right; and Congress has the constitutional authority to set the budgets and rules for any expenditure of public funds and resources. But many of these executive actions have not waited for either explicit or implicit Congressional approval, and in some cases have even directly ignored past Congressional mandates for appropriations. Relative to the sheer size of the federal government as a whole, the amount allocated for supporting science is not massive. The NSF mathematics and physical sciences (MPS) directorate, for instance, is the largest of the subdivisions of the NSF, and has an annual budget of approximately $1.7 billion. This looks significant until one realizes that it amounts to about five dollars per US citizen per year, and less than a tenth of a percent of the federal budget as a whole.

Critically, the gains the public receives from the outputs of this research funding—which is not protected behind patents or corporate secrecy, but shared openly for all to use—are outsized compared to the initial investment. We take for granted the ability to predict the trajectory of extreme weather events, navigate accurately across the country, or perform financial transactions securely over the internet; but the infrastructure, science, and technology needed to make these sorts of useful services possible ultimately stems from past research in the fundamental sciences, including mathematics, much of which was enabled by prudent investment by federal science agencies in years past. One prominent recent example of this was the rapid development of effective and life-saving mRNA COVID-19 vaccines. This development was enabled by a combination of efforts, prominently including the first Trump administration's "Operation Warp Speed" of 2020 - 2021, as well as decades of foundational research in the structure of mRNA and the role it played in immune responses.

But appeals to long-term national interests, such as the development of future technologies or the training of the next generation of leading scientists, fall on deaf ears at the current administration. Instead, the independent authority of science to arrive at data-driven conclusions—even if they are at

odds with preconceived political ideology—is perceived as a threat to the administration's efforts to consolidate power and control the narrative. This not only leads to absurdly comic events—such as the manual alteration of an NOAA hurricane forecast map with a Sharpie to align with a Presidential tweet—but also to the disregarding of the best scientific advice to address future crises. Whether it is with regards to climate disasters, emerging pandemics, or disruptions to the safety and availability of our food and water supply, the administration is set on flying blind.

In view of the seemingly relentless assault on both the funding and the underlying principles of science, what can private citizens do in response? Traditional political responses, such as writing to one's member of Congress, may appear inadequate, but can still have a cumulative impact and influence on future Congressional appropriations and laws. Expressions of support of scientific institutions and organizations, whether they be financial, in kind, or simply verbal, are certainly greatly appreciated; the sheer number of people reaching out to me with offers of help during the most recent funding crisis was both meaningful and morale-boosting to myself and my colleagues, as well as providing the actual financial resources to avert complete chaos.

But it is also important to have a more open discussion about the role and value of science in today's world, and not allow those opposed to these roles to dominate the narrative and normalize their extraordinary and unprecedented actions. In the more tranquil past, I myself was content to largely focus on technical or personal aspects of my own research, teaching, and mentoring, and leave the broader political debate and activism to others; but in our current environment, when even the most benign activities are subject to capricious disruption and political interference, the luxury of disengagement is no longer a viable option.

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