SCIENTIFIC AMERICAN

The Great Meteorite Heist

How Your Brain Learns to Lie

Do Anti-inflammation Supplements Work?

Life's Big Bangs

Did complex life emerge more than once?

NOVEMBER 2025
SCIENTIFICAMERICAN.COM

America Is Choosing to Lose the New Space Race

The U.S. can't be a space superpower if it dismantles NASA's science projects **BY THE EDITORS**

IN THE EARLY 1400s, nearly a century before Columbus's fateful voyage to the Americas, China seemed most poised to use maritime might to create a global empire. Beginning in 1405, Ming Dynasty admiral Zheng He commanded a fleet of immense "treasure ships" on a series of expeditions across the Indian Ocean, showcasing China's wealth and strength as far afield as the eastern coast of Africa. But by 1433 the state-sponsored voyages had ceased.

Scholars still debate what led 15th-century China to turn inward, ceding its power—and ultimately the discovery of what would become the New World—to others. But regardless of its cause, the missed opportunity is unquestionable.

Today a strange echo of this episode is unfolding—on the high frontier of space rather than the high seas. This time, however, China is rising to prominence as the U.S. squanders its advantages. Unlike the Ming court that made no secret of decisively abandoning China's naval aspirations, some U.S. leaders now embrace space as a vital, contested domain. But while they insist they're setting a course for America's continued dominance in space science, technology and exploration, their actions are contradicting and undermining that goal.

Skepticism about, if not outright scorn for, civilian space spending is practically a bipartisan tradition in U.S. politics, but we are talking chiefly about the "Make America Great Again" policymaking of President Donald J. Trump.

On July 20, the 56th anniversary of the Apollo 11 moon landing, the White House released a statement in which Trump proudly declared his administration was "reigniting the United States' leadership in space" and pledged to return Americans to the moon and send them to Mars. Weeks earlier, thanks to Trump's signature budget-reconciliation bill (the "Big Beautiful Bill"), NASA had received nearly $10 billion in additional funding for heavy-lift rockets, crewed spacecraft, and other things crucial to the Artemis program, which officially began during Trump's first term. Acting NASA administrator Sean Duffy has repeatedly parroted similar talking points. During a September press conference, he said "we're in a second space race right now; the Chinese want to get back to the moon before us. That's not going to happen. America has led in space in the past, and we are going to continue to lead in space in the future." The U.S., Duffy asserted, would achieve this feat in 2027. (Duffy's remarks came a week after his Trump-appointed predecessor, Jim Bridenstine, more realistically testified to Congress that "unless something changes, it is highly unlikely the United States will beat China's projected timeline [of 2030] to [send humans to] the moon's surface.")

The Trump administration does deserve credit for some sound space policy—such as two executive orders, one in 2020 seeking to extend the economic sphere of the U.S. and its allies beyond low-Earth orbit and another in 2025 to supercharge U.S. capabilities by streamlining regulations for domestic commercial space companies. Similarly, this past August, Duffy announced the administration's plans for NASA to fast-track readying a nuclear reactor for launch to the moon by 2030—a bold move meant to secure valuable lunar territory and eventually power U.S. outposts there.

But these acts must be considered alongside other policies and proposals that influence U.S. scientific and technological prospects off-world and on Earth.

Chief among these is the White House's proposed spending budget for fiscal year 2026. Despite the boost to the Artemis program, Trump's FY2026 proposal called for cutting NASA's overall budget by about 25 percent, with the agency's science division being slashed by nearly half. Advocacy groups such as the Planetary Society—as well as all seven living former NASA science chiefs—

Illustration by Martin Gee

have condemned these proposed cuts as catastrophic for U.S. space science. The cuts, they warned, would lead to the cancellation of more than 40 ongoing and planned U.S. space missions. On Trump's chopping block are high-profile, decades-in-the-making projects such as NASA's Mars Sample Return mission and the next-generation Nancy Grace Roman Space Telescope. These have counterpart competitors in China, which is proceeding unimpeded toward space leadership.

The cuts proposed for FY2026 are not the administration's only harmful moves: White House actions have led to the shedding of more than 2,500 NASA staffers, most of them senior employees. Innumerable federal research grants have been canceled, suspended or delayed because of ideological litmus tests. Thousands of foreign students and skilled professionals have been blocked or discouraged from living and laboring in the U.S. by immigration and guest-worker policies. As the federally funded scientific enterprise staggers and a U.S. brain drain accelerates after these heavy blows, affecting both new and longtime workers, China and other nations are opening their doors to international students and scientists, including American ones, offering generous financial incentives and building state-of-the-art research hubs to attract talent from around the world.

It's hard to see how America's losses across these myriad domains won't lead to other nations' gain, even if we can't predict the marvelous opportunities we'll be missing out on. And, just as with China's befuddling decision to retreat from maritime greatness nearly 600 years ago, it's harder still to understand why U.S. leaders today seem so eager to lose this new space race. Trump's push to make America great again in space presumes America isn't already the world's greatest spacefaring power—which it demonstrably is, albeit perhaps not for much longer.

Our nation's continued greatness in space requires giving more support to government-sponsored R&D rather than less and respecting, not disdaining, science—irrespective of politics. ■

Can AI Outdo Mathematicians?

AI models supposedly did well at a math olympiad, but how they got their answers reminds us why we still need people doing math

BY EMILY RIEHL

A DEFINING MEMORY from my senior year of high school is a nine-hour math exam with just six questions. Six of the top scorers won slots on the U.S. team for the International Math Olympiad (IMO), the world's longest-running math competition for high school students. I didn't make the cut, but I became a tenured mathematics professor anyway.

This year's olympiad, held this past July on Australia's Sunshine Coast, had an unusual sideshow. While 110 students from around the world went to work on complex math problems using pen and paper, several AI companies quietly tested new models in development on a computerized approximation of the exam. Right after the closing ceremonies, OpenAI and later Google DeepMind announced that their models earned (unofficial) gold medals for solving five of the six problems. Researchers such as Sébastien Bubeck of OpenAI celebrated these models' successes as a "moon landing moment" by industry.

But are they? Is AI going to replace professional mathematicians? I'm still waiting for the proof.

The hype around this year's AI results is easy to understand because the olympiad is hard. To wit, in my senior year of high school, I set aside calculus and linear algebra to focus on olympiad-style problems, which were more of a challenge. Plus, the cutting-edge models still in development did so much better at the exam than the commercial ones already out there. In a parallel contest administered by MathArena.ai, the models Gemini 2.5 pro, Grok 4, o3 high, o4-mini high and DeepSeek R1 all failed to produce a single completely correct solution. It shows that AIs are getting smarter, and their reasoning capabilities are improving rather dramatically.

Yet I'm still not worried.

The latest models just got a good grade on a single test—as did many of the students—and a head-to-head comparison isn't entirely fair. The models often employ a "best-of-*n*" strategy, generating multiple solutions and then grading themselves to select the strongest. This is akin to having several students work independently, then get together to pick the best solution and submit only that one. If the human contestants were allowed this option, their scores would likely improve, too.

Other mathematicians are similarly cautioning against the hype. Terence Tao, the 1988 IMO gold medalist (currently a mathematician at the University of California, Los Angeles), noted on Mastodon that what AI can do depends on what the testing methodology is. IMO president Gregor Dolinar said the organization "cannot validate the methods [used by the AI models], including the amount of compute used or whether there was any human involvement, or whether the results can be reproduced."

Besides, IMO exam questions don't compare to the kinds of questions professional mathematicians try to answer, for which it can take nine

Emily Riehl is a mathematician at Johns Hopkins University, where she works on category theory, homotopy type theory and computer formalization. Her book *Elements of ∞-Category Theory*, co-authored with Dominic Verity, was published in 2022 by Cambridge University Press.