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Let NASA Do What NASA Does Best

Increasing NASA's budget would ease pressure and allow the agency to dream even bigger **BY PHIL PLAIT**

NASA has a planet-size problem on its hands. Ironically, its source is here on Earth: Congress, which has the penny-wise but pound-foolish policy of releasing just a trickle of funding to the space agency every year, hobbles many of NASA's mission goals that require thinking past a two-year House or six-year Senate term. This hurdle has repercussions that can be felt across the solar system.

Right now on Mars the Perseverance rover is collecting small samples from inside the 45-kilometer-wide Jezero Crater, which held a huge lake billions of years ago. Scientists consider it one of the best places to scout for evidence of ancient life on Mars or at least to see whether conditions were ripe for its genesis.

These Martian souvenirs safely rest inside hermetically sealed cylinders that are either stored onboard the rover or dropped in strategic locations on the planet's surface. A future Mars-bound mission will pick them up and bring them to Earth for study. The problem? That later mission currently does not exist—and it's not clear when it will.

Last September an independent review board investigated the current state of a Mars sample return (MSR) mission and found there is a "near-zero probability"—tech speak for "no way"—of its being ready for launch by 2028. It could meet a 2030 deadline but at a cost of $10 billion, which would make it among the most expensive science projects NASA has ever undertaken.

But it's a vital part of NASA's plans.

The National Research Council's Planetary Science Decadal Survey for 2013–2022, created by a panel of dozens of leading scientists, stated that an MSR was a "highest-priority flagship mission" for that decade. A 2008 NASA preliminary planning document reported that of 55 important investigations into Mars, half would be addressed by an MSR. Looking into the idea of life on Mars, ancient or extant, is clearly a critical scientific goal for NASA with potentially immense significance for all of humanity.

The first part is already underway. A decade-old report from the Mars 2020 Science Definition Team states that using the Perseverance rover to collect samples from the planet's surface would lower the cost of a future MSR mission. "Any version of a 2020 rover mission that does not prepare a returnable cache would seriously delay any significant progress toward sample return," it notes. Heeding that advice, NASA designed Perseverance to collect those samples, and the rover has been doing so since 2021. Now comes the hard(er) part: delivering them to scientists on Earth.

Until very recently, the plan was to use Perseverance itself to bring the collected samples to a suitable landing spot. While this would take time away from its exploration (and, more worrisome, would make the mission run up against the expected life span of the rover), it's probably the safest and easiest method, and it's certainly the most cost-effective.

In the meantime, NASA would build a lander and a Mars Ascent Vehicle (MAV), a rocket that would take Perseverance's samples into Martian orbit. (The lander would come equipped with two sample-carrying helicopters, based on the successful Mars Ingenuity Helicopter, as a backup if Perseverance couldn't complete the task.) From there a European Space Agency Earth Return Orbiter mission

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A Mars vista captured by NASA's Perseverance rover in April 2023

NASA/JPL-Caltech/ASU/MSSS

would rendezvous with the MAV, ingest the sample container—literally opening up and "swallowing" it—and bring it to Earth, where it would land in the Utah desert like the OSIRIS-REx return capsule did recently with its asteroid samples.

The 2023 independent review board put the kibosh on that, however, finding that this mission cannot be accomplished in the needed time frame with the available budget. In essence, NASA has to start planning the MSR all over again. The good news is that this work has already begun, and the space agency hopes to have a new mission concept by this spring.

It's easy to point fingers at NASA for the cost overruns and schedule delays, but to be fair, the agency played by all the administrative rules. That's not to downplay mismanagement issues, which the independent review pointed out in detail, but, honestly, those kinds of problems can be expected for huge projects spanning multiple divisions of a government agency. Committees met, ideas were debated, reviewers reviewed, and the best plans advanced. Then reality intruded. Getting to Mars is *hard*. Many missions never make it. Adding the incredibly complex technical issue of not only getting back but doing so after a complicated orbital rendezvous makes matters more than twice as hard. Just getting into orbit from the Martian surface is ridiculously difficult, and NASA's important requirements for testing and redundancy—in the case of the MAV, at least—make it all but impossible under the current plan.

Where does this leave things? Well, the MSR could be canceled, but that is clearly the worst possible option. Given the mission's scientific importance—and all the time and money already invested, as well as the efforts undertaken by Perseverance—this idea shouldn't be considered seriously. NASA could trim the MSR's budget, but at this point under the current plan, that would do more harm than good. There's no science being done with an MSR, so all the engineering is geared toward picking up the samples and getting them to Earth. Cutting any of the tech needed for that could jeopardize the mission.

So here's my radical thought: Fund it. *Fully.* Give NASA what it needs to make this mission work, including a wide-enough margin for technical safety considering the difficult nature of the engineering and management required.

By "fund it," I don't mean take needed money away from other deserving endeavors, as has happened when other NASA missions have run over budget. And I don't think it should become a separate line item in NASA's budget, as the James Webb Space Telescope did when its costs bloated. That approach might suffice for this particular case, but it is not a long-term solution for NASA's predicament.

The basic issue here is that NASA's funding is a zero-sum game, so cost overruns in one mission affect other projects. But the money shuffling wouldn't be so dire if NASA simply had a bigger overall budget. This increase would also fix many of the management problems pointed out in the 2023 MSR report, allowing NASA to hire more technical and administrative staff.

This funding shouldn't be controversial, but NASA's finances are hugely exaggerated in public perception compared with the actual budget. According to one poll, in 2018 the average American thought NASA received more than 6 percent of federal spending, when in reality it gets only 0.5 percent. Given the amazing things NASA achieves with this tiny slice, a dedicated effort to correct this misconception would make increasing the space agency's funding much less of a political struggle.

From a strictly economic point of view, NASA returns far more money than it is given. The agency estimated that it generated an economic output of $71.2 billion in 2021; that puts its return on investment at around $3 for every $1 going in. And, of course, we get a lot more from NASA than simply economic benefits.

In general, NASA's science and exploration enjoy broad bipartisan support. This fact is especially remarkable in today's political environment, where it might be hard to get the two parties to agree on the time of day and where Republicans have a history of trenchant antiscience stances—especially when it comes to climate science, a field NASA heavily supports.

Increasing NASA's resources should be a no-brainer. Instead Congress has tended to target NASA whenever a budgetary ax is wielded. This makes zero sense given how small a portion the agency gets. Cutting NASA's funding is like making room on your computer's hard drive by deleting tiny text files while ignoring the gigabytes of movies you've already watched.

Please note that I'm talking about what we *ought* to do. That may be a stretch with a Republican-led U.S. House of Representatives that in 2023 proposed bludgeoning NASA with a 22 percent cut that would kill the MSR, end moon landings and lead to 4,000 layoffs. Perhaps if the public were more vocal, Congress might listen. *Might.*

A monkey wrench in all these works is the bipartisan Fiscal Responsibility Act of 2023, intended to thwart debt default by the federal government. Part of the fallout from this act, which became law last June, is a cap on NASA's budget until 2025. This cap has had an impact already: NASA officials are considering cuts to the Hubble Space Telescope and the Chandra X-ray Observatory, two of the space agency's workhorses. Increasing the budget for an MSR is essentially impossible as long as this act is in effect, and the uncertainty about funding makes it difficult for NASA to know exactly how to move forward on any new designs.

If the MSR—and NASA itself—can weather these setbacks for the next two or three years, there may yet be a path forward. Despite all this havoc, the argument for increasing NASA's overall budget still stands. Boosting it by, say, 20 percent to $30 billion a year would ease a vast amount of pressure the agency finds itself under when proposing and building new missions. Even doubling its funding would hardly make a dent in national spending, and the payoff would be tremendous. This isn't to say that everything NASA does is cost-effective; for instance, I have been vocal about the enormously bloated and decreasingly useful Space Launch System rocket. But that project's delays and overruns can be traced to congressional meddling. With less pork-barrel legislation and better management, NASA could deliver on its promise of bringing the universe to Earth.

With an MSR, we have a real shot at investigating some of humanity's oldest and most fundamental philosophical questions. How did we get here? Are we alone? The cost to find these answers, even in the near term, is relatively trifling. ●