

Name: Collins, Isabel

Essay: What can I do to further space exploration?

Yesterday, to celebrate the completion of my physics and calculus AP exams, I settled down to read a rather ridiculous science fiction novel, *The First Men in the Moon*, by H. G. Wells. The novel begins with a brilliant scientist asking himself why something couldn't be opaque to gravity just as metal is opaque to light. He then quickly creates such a material and uses it to fly off to the moon. Mission accomplished.

Of course this is nonsense. Nothing can be "opaque" to gravity because gravity doesn't go "through" anything. As Stephen Hawking's *A Brief History of Time* had explained to me a few weeks prior, gravity is simply what we call the effect of the curvature of space-time that mass creates. When I checked the publication date of *The First Men in the Moon*, I found 1901. *A Brief History of Time* was published in 1988. I am reading them both in 2020. In 87 years, gravity went from being barely understood to being well-tested scientific theory. In just another 32 years, it has become common knowledge. Even more interestingly, both books (one science fiction and one science nonfiction) were bestsellers. Why? Because people love space. It took a desire to understand the motion of the stars for people to understand the force that acts on every object on earth, and it took the idea of alien worlds for people to become interested in the broad ideas of physics that *A Brief History of Time* describes. Why does it matter that people are interested in space? How does a general increase in scientific knowledge change humanity? Interest in space and increase in scientific knowledge change humanity because science cannot be done alone. Does every little boy and girl (like me) who wanted to be an astronaut grow up to be one? Of course not. But early interest in space can spark an interest that can lead them to discover that they love another field of science even more, like chemistry or molecular biology, and then they can grow up to be great doctors or engineers or researchers. Space exploration, whether it is through literature or theoretical physics or actual travels by astronauts, is needed because it ignites the imagination in an intuitive way and begins a fascination with STEM fields that can last a lifetime and affect all humanity.

The effects of the Space Race to put a man on the moon encouraged by John F. Kennedy during the Cold War were not only successful in themselves, they also created infrastructure for STEM education that is still making an impact today. For example, the 1957 opening of my high school, which is consistently ranked the top school in Louisiana and which focuses on math and science, was inspired by the Space Race, and the National Defense Education Act ensured that many other schools with a similar focus were created. Also, the Space Race acted as a centripetal force in American society, bringing citizens together under math and science with a shared goal, strengthening society as a whole.

All in all, it seems, the Space Race was a success on several levels. So what changed? Why has funding for space exploration been cut in recent years and how can we change public (and lawmaker) opinion to stop these cuts?

What changed is the public opinion of space exploration. As money has been pulled from space to go toward other priorities, space exploration came to be seen as a luxury, something trivial, unnecessary. The fascination with space seemed to drift farther and farther away from the public imagination and to become the exotic realm of a cliché group of nerdy if not mad scientists. This neglect causes a feedback loop in which funding is cut from space exploration, and as funding is cut, the now underfunded space programs seem less powerful and important.

To reverse this cycle, we have to start small. To further humanity's expansion into space, we have to start with changing the public opinion of the space program and increasing federal funding towards NASA. To do that, I'd start just like Kennedy did: with the young. From 2020 to 2025, I would work with educators to provide children more exposure to space careers and from a younger age. Books like *The Planets* by Dava Sobel could be given to junior high schools. *The Planets* is exciting and easy to read, and little to no understanding of physics or chemistry is necessary to enjoy it. Children should also be taught physics from a younger age, beginning in seventh or eighth grade as they gain the mathematical fluency to make the subject possible. I would also encourage NASA to expand its current social media presence; although there are official NASA and related pages on most social media platforms (such as Instagram) already. I would recommend that NASA create a Netflix documentary series with episodes highlighting a diverse range of people from different backgrounds who work in various departments and fields. Not only would this increase public awareness and appreciation for NASA, but it would also help to convince the public and lawmakers to fund space programs because they would be able to see where the money is going and why space exploration is necessary.

A new president will have been elected by 2024, and he or she should be making their first State of the Union address in 2025. If I had his or her ear, I would try to convince the President to mention strengthening the space program in the State of the Union address because this would vitally affect not only the public opinion of NASA, but also the crucial opinion of NASA held by lawmakers. How to convince the President? The main argument I would use would be to emphasize a collaboration between the military and NASA. Both NASA and the military require highly specialized equipment such as satellites, high energy fuel, and aircraft. Furthermore, as evinced by the prior discussion of gravity, the more we discover about outer space, the more we discover about the laws of physics here on earth. Research into rare elements and isotopes or quantum discoveries made by NASA could easily be applied to the military. I would recommend that some of NASA's funding go towards finding ways to adapt new discoveries towards military use. If Donald Trump's Space Force is any indication, this military-NASA collaboration would likely help justify space program expenditures to both sides of the political spectrum.-

From 2026 until 2035, I would focus on setting, popularizing, and meeting a specific goal in space exploration. Giving the space program a goal and a clear plan will allow the public to rally behind one popularized idea, just as they rallied behind the idea of sending a man to the moon. Luckily for me, the public today seems even more easily gathered behind ideas, even ridiculous ones, than they were in the 1960s (as shown by the recent raid of Area 51, which was organized with a Facebook group and made national news). There are some qualifications which I would use to select my goal: 1) it must be exciting (something I'd enjoy reading a science fiction book about, for example, not an achievement of a niche scientific field); 2) it must promote competition (to play upon the common ideal of American Exceptionalism, this goal must promote America as the first or the best); 3) it must be plausible. Something like growing corn on the Moon. It's exciting, like the science-fiction movie *The Martian*. It promotes competition: not until the development of agriculture did humans start to have permanent homes, so the idea of growing food somewhere gives space agriculture the feeling of almost establishing a second home. Therefore, if we grow corn (an archetypal American staple) on the Moon, we wouldn't just have the first man on the moon, we'd be the first to take steps towards making it livable for mankind. Finally, this goal is (somewhat) plausible. Seeds have already been

germinated in the International Space Station. To grow corn on the moon, all we would have to do is create a greenhouse filled with organisms that replenish the carbon dioxide and nutrients needed for corn to grow. This is, of course, ignoring the challenges of long lunar days (each day and night on the moon is two weeks on Earth) and the lack of the atmosphere to filter out radiation from the sun, which would require genetically altered corn to be made to withstand these circumstances. However, given fifteen years, I'm sure that creating such an environment is not a more amazing feat than sending a man to the moon for the first time (which happened only eight years after JFK's statement of the goal). In 1961, a man had never even been in orbit. However, the specific goal is less important than that it be specific to capture the imagination of the public.

In fifteen years, I think that it should be easily doable to completely turn around the public opinion of space exploration. By 2035, the people who were five years old as I started my space program campaign will be fully fledged voters who will have grown up reading books and watching movies (both as a part of my plan) about careers in NASA, and it will be in their hands to continue to advocate for the space program. Luckily for us, people are naturally intrigued by the mysteries of space. Convincing someone to fund the exploration of new worlds is much easier than convincing someone to fund the exploration of new calculus. All we have to do is remind the public of their innate sense of wonder about the Universe, and about all the good this sense of wonder can do here on Earth.