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Taking Aristotle to the Moon and Beyond

For space exploration to benefit all of humanity, it needs a philosophy—a rigorous engagement on values, impact, and meaning.

In 2009, journalist Tom Wolfe, author of the space-age classic *The Right Stuff*, wrote an opinion piece for the *New York Times* entitled "One Giant Leap to Nowhere." Commenting on the Space Shuttle program, Wolfe recapped the first four decades of the space race and quipped, "NASA never understood the need for a philosopher corps." According to Wolfe, NASA would never recover its lost vitality and sense of purpose because it had no philosophy of space exploration.

I increasingly suspect he was on to something. For space exploration—whether robotic or human, expeditionary or remote, commercial or government—to pursue its full potential, contribute to the general welfare of the United States, and provide benefits for all humanity, there must be a deep, rigorous engagement with the concept from everyone and for everyone. In other words, to best explore space, society needs to have a communal conversation on exploration's value, impact, and meaning.

We can learn from the past. In 1969, Apollo 11 accomplished exactly what President Kennedy called for in his 1962 speech at Rice University, when he challenged NASA to send a human into the heavens to walk upon the surface of another world and return to tell the tale. "We choose to go to the moon in this decade and do other things," he said, "not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win." But when the first human landed on the moon, to great fanfare, that success created a paradox: going to the moon eliminated the reason for going to the moon. Three of the nine missions planned after Apollo 11 were canceled. Indeed, in the five decades since Apollo, no earthling has ventured beyond low Earth orbit.

The lack of a consistent, enduring approach to contemplating human activity in space has, I would argue, cast a pall on NASA's deep space human exploration ambitions. The 2003 Columbia disaster prompted decisionmakers to reassess NASA's human spaceflight aims, leading to the Bush administration's decision to resume human expeditions beyond low Earth orbit. Since then, the agency has enjoyed relatively persistent, if modest, political support for an open-ended campaign of human deep space exploration. However, that support has manifested itself in different ways across, and even within, four administrations. Most recently, the Artemis program—formally launched by President Trump in 2017—set an ambitious goal to return humans to the moon in 2024. But that moon landing has already been delayed until at least 2026. And, tellingly, the Artemis Base Camp, initially proposed as an integral part of returning to the moon, has been caught in the budget squeeze. Work may be delayed well into the 2030s.

This hazy mandate to send humans to the moon and then Mars—without identifying a specific purpose for such an endeavor—leaves NASA with the substantial practical challenge of trying to sort out the complex ambitions, myriad options, and limited budgets of human expeditions into deep space. Still, predictable delays and budgetary shortfalls

present an opportunity for NASA to revisit its reasons for sending humans to walk, once again, on the soil of alien worlds. If NASA's planning is to ever really get ahead of its immediate mission ambitions and develop a sense of strategic coherency, now is the time to make that happen.

Telic goals vs. an infinite universe

As a space policy professional and, more recently, a student of the history and philosophy of space exploration, comparing the end of the Apollo program with the beginning of Artemis strikes me less as a matter of technology or budget and more as a matter of *telos*, or purpose. Aristotle identifies telos as a "final cause," the end state toward which something's existence ultimately leads. President Kennedy's speech at Rice established a clear *teleo*logical foundation for Apollo—both in the explicit challenge of putting an astronaut on the moon and returning him safely to Earth before 1970, and in the implicit goal of beating the Soviets.

Aristotle's telos forces consideration of an end, or, as he put it, "that for the sake of which everything is done." Open-ended activities, though—like exploring the universe—can be described as *atelic*: they have no specific endpoint. Even if a country is the first to reach the moon, there is no point at which any nation can declare exploration of the universe complete. The former is a telic activity, the latter atelic. Apollo was launched on a firmly telic basis but lacked a sufficiently strong rationale to keep going.

Telic activities have a particular modern appeal; they lend themselves to bold proclamations, a multitude of program management tools, and regular progress reports. Concrete goals work for space exploration because they fuel a sense of direction and progress, and, most importantly, narrative. Narratives have a beginning, middle, and end. We start at the beginning; the telic goal defines the end. All that remains is the middle part: figuring out ways that available means can achieve those ends. Space exploration needs signposts and metrics to feed narratives of technological advancement, forward progress, and futurity. NASA excels at all of this. The catch, as NASA discovered, is that a telic goal *can* be completed, exhausting the mandate that set everything in motion and bringing the narrative to a close.

Atelic efforts, lacking discrete, concrete ends, are different. Without clear goals against which progress can be measured, atelic efforts are essentially everlasting. They emphasize process, not destination. If the atelic pursuit involves doing something that's intrinsically good, it can resemble a virtuous activity. And, where telic goals invite debate about the particular, pragmatic value of reaching an end goal, the atelic emphasis on enduring value changes the character of that debate. Thus, applying an atelic approach to space exploration could give voice to the transcendent character of the endeavor, liberating the constraining concept of mission value from the strictures of cost, engineering, and schedule—or even complete agreement on ultimate objectives. Atelic rationales could make room for the same kind of thinking that put a golden phonograph record, *The Sounds of Earth*, on each Voyager spacecraft, destined to drift forever across the interstellar night.

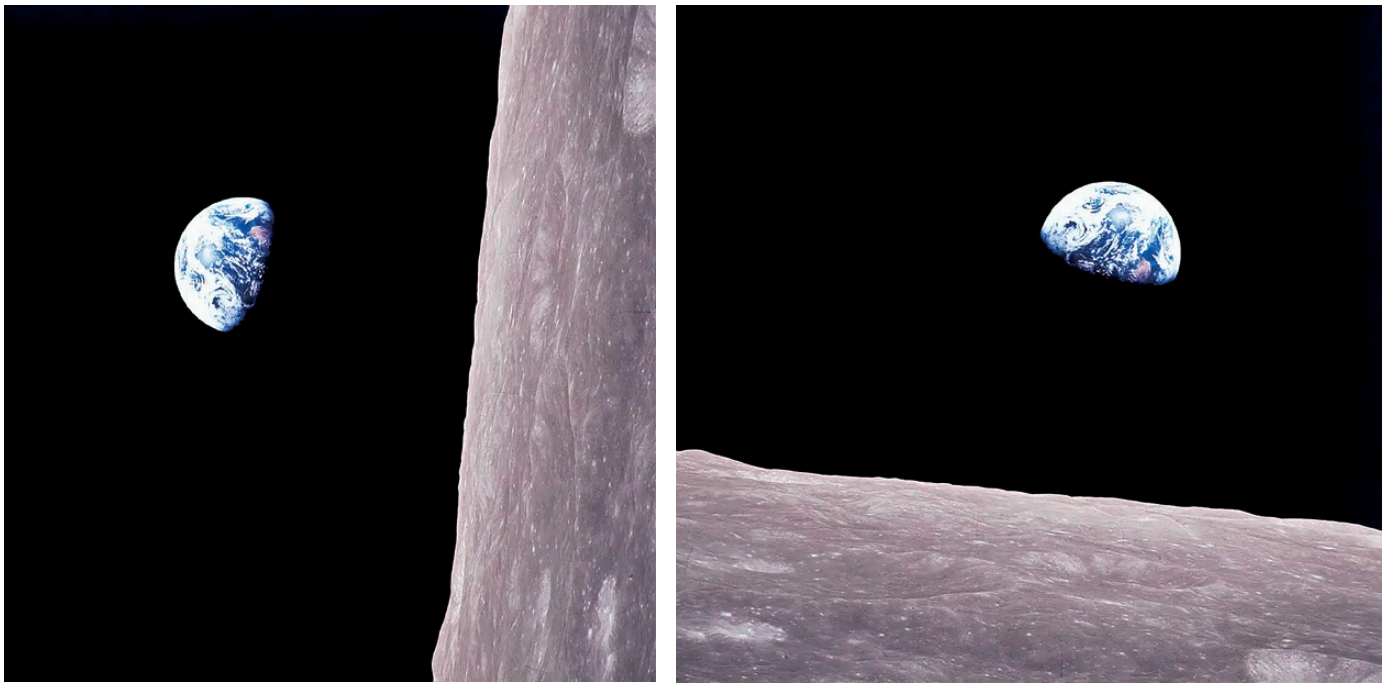
Within the space community, decisionmakers are constantly grappling with questions of worth and value. Is spending money on space exploration worth it? In what way? To whom? With limited space exploration resources, should a country work toward specific, concrete goals, or broader, more enduring ones?

In space exploration, pragmatic, telic objectives are sometimes at odds with atelic, virtuous pursuits. Should astronauts investigating rock formations on the moon be focused on finding commercially viable mineral deposits, or should they be looking to learn more about how the moon was formed? Another atelic defense of space exploration might posit that sending people out into the cosmos to experience life beyond this world is good in itself. Also atelic: Elon Musk's statement that he is working "to extend the light of consciousness to the stars." Encouraging activities on other worlds could have multiple indirect benefits without any practical tangible impact.

Since its creation in 1958, NASA has periodically tried to grapple with deeper questions around the value and meaning of space exploration. By law, the agency's goals are superordinate to the conduct of science. Title 51 of the US Code—which incorporates the original National Aeronautics and Space Act that created NASA—lists NASA's purpose, authorities, and responsibilities. NASA exists to contribute to the "general welfare of the United States" by conducting aerospace and space activities that will meet both scientific and non-scientific objectives, such as economic competitiveness and international cooperation. Founding documents emphasize peaceful scientific activity led by a civilian agency for the betterment of all humanity. At NASA, science has a seat at the table, perhaps even a preeminent one—but not the only one.

Title 51 doesn't provide clear guidance on how NASA is to reconcile its different prerogatives, so the agency needs to find new ways to think about its endeavors that move beyond familiar quantitative measures like cost and schedule—especially for long-term planning. What is really needed are answers to the fundamental questions of purpose and telos posed by both the Apollo and Artemis programs: Why should humans aspire to tread upon the face of a heavenly body in the first place? If the objectives are telic, then at what ends should those efforts be aimed? If the purposes are atelic, what are they?

The 1965 volume *The Railroad and the Space Program*, edited by historian Bruce Mazlish, is one of NASA's most significant early forays into pursuing these deeper questions. A similar attempt to understand space exploration through a



The famous "Earthrise" photograph, captured in 1968 during the Apollo 8 mission, has been described as "the most influential environmental photograph ever taken." When the astronauts took the photo from the capsule, they "saw" the image as it appears on the left—Earth seen from Apollo as it orbited the moon. Since then, in a persistent example of terrestrial bias, designers and editors using the photograph seem to insist on rotating the image, as shown on the right, as a person standing on the lunar surface might see Earth rising above the horizon. Courtesy of NASA.

larger conceptual frame has driven other efforts at the agency, including the recent report on the Artemis program's ethical, legal, and societal impacts.

The challenge for the future is understanding how human passions and inclinations can inform and engage space exploration without succumbing to the "terrestrial privilege" of "armchair astronaut" commentary that is often long on wild speculation but short on concrete understanding of the engineering, budgetary, and political challenges facing NASA. How can we, in exploring space, discover and create value and meaning? How can we yoke space exploration to our finest impulses in a truly self-sustaining and beneficial way?

To build a moon base or not?

Artemis provides a good opportunity to think about how a deeper engagement on space values, impact, and meaning might unfold. For example, in current plans, the goal is to build a base at the lunar south pole and use robots to carry out surface exploration elsewhere on the moon. However, there has been some quiet speculation that NASA might be better served by indefinitely delaying (or canceling) a permanent base in favor of conducting human-led scientific investigations at multiple locations around the moon. Another option is a mobile base—a robotic lunar RV, stuffed with lab equipment and living facilities—that could be telerobotically driven anywhere on the moon to greet astronauts wherever they land. In all of these options, there is a question of whether NASA should turn its attention from establishing a permanent outpost toward a more science-focused approach with human-led sorties.

Of course, the concept of telos is just one of many tools in the philosophical toolkit. Considering the Artemis effort from a broader philosophical standpoint can reveal widely divergent visions of what space exploration should be—and perhaps offer guidance in the choices ahead. For example, insider discussions about a permanent base versus a more peripatetic approach point to larger questions that are as philosophical as they are practical: Why go to the expense and danger of sending humans into space at all, rather than working with robots? Is there an inherent value to human presence in space? And if so, what is it? Is the scientific benefit commensurate with the added cost and risk? Are the benefits of human presence enhanced by continuous permanent residence?

In the case of building a base at the lunar south pole, many pragmatic, telic arguments are available—not least of which is the simple political value of having a discrete objective and creating a concrete psychological anchor for subsequent lunar activity. In my opinion, although base building provides an attractive telic goal with some hints

of future pragmatic value, it ultimately does not present a strong enough atelic argument on its own and risks recreating the "goal attained" trap of Apollo.

But, chosen carefully, some telic objectives could mature into enduring atelic efforts. For example, a goal-oriented presence could potentially be framed under an overarching atelic framework of expanding knowledge or advancing exploration. Alternately, a series of atelic activities can transform, after a few unexpected breakthroughs or discoveries, into a post hoc telic narrative, as if the goals had been clear all along. Or perhaps an atelic argument will surface on its own. Maintaining a persistent presence on the moon would create more open-ended opportunities, such as permitting NASA and its partners to more substantively weigh in on the values and standards to which humans should adhere as they reach out into the cosmos.

Norms offer a particularly interesting way to contemplate how telic and atelic aims consolidate support for space exploration. NASA will not be alone on the moon; several nations are joining the effort while a rival China has announced its own plans. Many of the norms that the international community has embraced explicitly set aside older, more familiar frameworks (such as sovereignty) that might otherwise guide our behavior. For instance, the UN Outer Space Treaty states that nations cannot claim sovereignty "by means of use or occupation or other means." What that means is still undefined. Can I build a structure right in the middle of someone else's landing zone? And then are they obligated to land elsewhere, or do I have to move? Either way, it looks like appropriation by occupation. Or, if two countries have their eye on the same location, who prevails? Does it matter if one is pursuing commercial use and the other scientific? Lunar surface activities could kick up a sizeable amount of dust that could interfere with other operations, but who sets those limits? Outer space is an alien environment that will expose and defy our unspoken assumptions and priorities. Philosophy gives us ways to frame and discuss them.

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Fusing the telic strengths of base building and the atelic strengths of science itself could also be productive. The general pursuit of universal knowledge and truth, frequently associated with scientific investigation, can be described as valuable in its own right. Building bases that can sustain a longer, more resilient pursuit of scientific knowledge could be a more enduring approach than pursuing either path—pure base or pure science—alone.

For Artemis to succeed where Apollo failed—providing for its successors—decisionmakers must think carefully about value and meaning in all areas of the mission. One of the ongoing discussions within NASA is about what building, operating, and owning a surface lunar habitat might entail. Commercial space advocates have argued that the private sector can provide exploration infrastructure more cost-effectively than the government—a practical advantage. But in the case of an Artemis base camp, turning to the private sector for a lunar surface habitat would present political and symbolic liabilities to the mission—an atelic threat. Artemis is sending Americans to live on the moon on behalf of their country and their world; ethical considerations (or even political logic) mean that they should be sent for virtuous reasons, rather than in pursuit of profit. Sure, a commercial habitat might (in theory) be more cost-effective, but at what cost? And will those savings be worth jeopardizing the symbolic impact of Artemis?

If it is to survive, Artemis cannot afford to appear as a way to turn scientific expeditions into expensive time shares in some rocket baron's celestial hotel. In any lunar base, ownership will feed into symbolic logic and rationale. As a base grows beyond the initial habitat and the symbolic requirements of NASA ownership are satisfied, a diversity of participants—including commercial ventures and international partners—becomes a way to broaden the sense of ownership and demonstrate the virtue of diverse approaches to transforming the moon into a human world.

Clearly, when making these sorts of decisions around building a lunar base, NASA must make choices that escape the bounds of quantitative, engineering, or cost-benefit analyses. Although it is one of the world's preeminent engineering organizations, NASA is not institutionally well equipped by culture, precedent, or inclination to incorporate considerations that fall beyond the telic utilitarian and practical aspects of completing a mission. Yet, NASA's core constituency is the American public, and to better serve that public, the agency needs a way to engage questions of values and visions and offer more straightforward and durable narratives of space exploration.

Philosophy for clearer public purpose

NASA needs to embrace philosophy so that it can better explain what it is doing and why to the public and itself. This is particularly important because, as a federal agency, NASA derives its overall purpose and direction from the public through elected officials. But even when Congress and the White House set the overall agenda (and budget!), the agency still needs an internal logic guiding its decisions.

Throughout NASA's research and exploration portfolio, a wide range of societal impacts, ethical considerations, and inspirational elements come into play. There are decisions to be made between favoring human or robotic expeditions that require understanding their differences and harmonizing them. And what should the agency's position be, for instance, on developing technologies that will ultimately be used by the private sector? Absent clearer, systematic thinking about such issues, NASA is compelling its scientists and engineers to act as philosophers on the spot whenever they favor a robotic or human mission, authorize a commercial contract, or make myriad seemingly routine decisions.

Although this ad hoc approach may seem like an organic way to deal with the problem of purpose, it is a missed opportunity. Leaving all decisions about societal values to engineering program managers on a case-by-case basis means NASA doesn't develop the ability to think more systematically about values, vision, and norms. And these are the core ingredients in shaping the guiding logic and narrative needed for a coherent strategy of space exploration.

Without a real way to consider what it does, NASA falls back on institutional interests and bureaucratic inertia. In other words, failing to deliberately engage philosophical debates about values and visions means that any exogenous NASA vision could become erratic, meaningless, or even subject to intellectual fads. The agency risks foundering as administrations and mandates change over time. It could get caught in the kind of pointless ideological food fights that would rob it of its broad, bipartisan appeal. Without a stronger sense of self, NASA risks getting dragged into someone else's ideological fantasy and souring the public on space exploration. Instead, NASA should cultivate a strong self-awareness about vision and mission.

And that self-awareness should be broad. One of the most persistent difficulties with thinking about space exploration is the immense amount of terrestrial bias that humans automatically bring to the table. Our cultures, norms, and institutions are grounded in the geographical and biological reality of where we live. Simply porting over terrestrial solutions means bringing along terrestrial assumptions, a potentially fatal mistake in the hostile and unforgiving domain of space exploration.

Terrestrial bias pops up in many small design decisions on spacecraft, including the occasional inclusion of drawers, which can jam without the aid of gravity to keep their contents in place. A broader philosophical framework can help explorers create a culture appropriate to the reality of living and working beyond Earth. Another example of the benefits of freeing our decisionmaking of terrestrial bias in favor of new ways of understanding the meaning and value of presence can be seen in the discussion around in situ propellants. Historically, plans to explore places like Mars assumed that astronauts would need to carry all the propellant for a return trip with them. By contrast, in situ resource utilization (ISRU) calls for sending robotic equipment in advance of a human landing to process carbon dioxide from the Martian atmosphere and manufacture the necessary propellant on site. The ISRU approach shows the importance of finding different ways to think about the value of Mars itself—reimagining it as a site of both scientific and industrial production—through rigorous philosophical engagement with space exploration.

Becoming interplanetary

Through exploration, a culture invests places with meaning, value, and context. The humanities of space exploration (including philosophy) will be much more than a series of ethics discussions or a set of telic and atelic goals. They will require a new consideration of the universe beyond humanity's tiny terrestrial oasis, along with a refined sense of our particular human and nationalistic baggage.

Leaving the world of living things to live and work in the vast, abiotic heavens is necessarily a matter of profound uncertainty and difficulty. Space exploration is, in general, a field that is influenced by an overabundance of enthusiasm and ideas. Less than a century into its expansion beyond Earth, humanity is still comparatively ignorant about the rest of the universe. We have imposed precious little meaning and structure to guide the ways we will collectively interact with worlds beyond. As a result, much of the speculation about the promises and perils of space exploration—often found in both popular and even some academic press—is essentially science-fictional. Many of the scenarios that excite popular imaginations and fears today are light-years from fruition. For example, large economically and technologically self-sufficient space settlements are decades and centuries away, not years. But in developing a serious space philosophy, NASA could help us learn to think like interplanetary people over that much longer time frame.

In his closing paragraphs, Tom Wolfe argues that what NASA needs is the power of clarity and vision. What NASA needs to succeed and endure is purpose, a sense of objective, and a guiding logic to animate its strategic thinking. Congress and the White House can give NASA its goals and the resources to reach them. But first, NASA must be able to provide better ways to address the deep questions of space exploration: Why? To what end? And for what purpose?"

The smallest step on the moon—or anywhere in the heavens—starts with a giant, collective leap of the mind.

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