America Seeking Moon Miners to Dominate Space

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November 2020 —op-ed (unpublished)

Space mining is the new gold rush. Expect it to make a mess.

This past fall, while spaceniks[i] were thrilling to the details of a NASA spacecraft grabbing a tiny sample of an asteroid named Bennu — a sample that promises precious hard evidence of conditions during the earliest eras of our 4.6-billion-year-old solar system — a more pragmatic kind of space grab was afoot, away from the spotlight: colonization of celestial bodies for the purpose of mining their riches. The result could be more gold but also more hazards to the near-Earth environment, where everybody's communications, weather, and all other satellites reside and which is already liberally peppered with anthropogenic debris.

On September 10, the soon-to-depart administrator[ii] of the National Aeronautics and Space Administration — Jim Bridenstine, a naval pilot and former Freedom-Caucus Republican congressman from Oklahoma — asked space corporations to betake themselves to the Moon without delay, scrape up a bit of its surface, and sell a few grams to NASA.[iii]

A bit of background. In May 2020 Bridenstine presented the U.S.-drafted "Artemis Accords: Principles for a Safe, Peaceful and Prosperous Future,"[iv] which set forth America's agenda for its return to the Moon — landing "the first woman and the next man" on the dusty reaches of our natural satellite by 2024, "heralding in a new era for space exploration and utilization." Mincing no words, Reuters headlined its summary of the document "a legal blueprint for mining on the moon."[v] Sprinkled with respectful references to the foundational Outer Space Treaty of 1967 and to "partner nations," the accords stipulate that "the ability to extract and utilize resources on the Moon, Mars, and asteroids will be critical to support safe and sustainable space exploration and development" and that NASA "is leading" the program. Note the bureaucratically low-key word "utilization," which in effect supplants the loftier "quest for knowledge and progress" of President Kennedy's 1961 Moon speech, though JFK's pervasive emphasis on U.S. leadership (in fact, "pre-eminence") remains.[vi] Partnerships under the Artemis Accords are bilateral (to date, there are nine), with the United States serving as each nation's partner and everybody's commander. Given that an Artemis Accord might become a prerequisite for participation in NASA's overall lunar program, the chance to have one of its own astronauts on the Moon would likely incentivize a nation to sign on.

So much for the global spirit animating the Outer Space Treaty, in which it is written that outer space "is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means." No need to materially honor such notions as the "province of all mankind"[vii] or the "global commons."[viii]

As the exiting occupant of the Oval Office said in June 2018 while demanding that the United States establish a new, sixth branch of the Defense Department, devoted wholly to space, "It is not enough to have an American presence in space; we must have American *dominance* in space. So important."[ix] Leadership, dominance, domination: same genus, different species.

The ambitions of both science-minded samplers and profit-minded[x] space miners have long extended well beyond the Moon, and they've spent decades pursuing public, private, and joint efforts to bring them to fruition. Back in the 1980s, Japan's Institute of Space and Aeronautical Science started to plan an asteroid sample-and-return mission.[xi] In 2005, the Japanese Aerospace Exploration Agency's Hayabusa spacecraft became the first to collect a few grains of asteroidal matter, which it delivered to Earth five years later.[xii] In 2008, the topic of the always-cutting-edge Isaac Asimov Memorial Debate, held annually at the Hayden Planetarium in New York City, was "Mining the Sky."[xiii] In mid-October 2020, the nonprofit Southwest Research Institute, having teamed up with Jeff Bezos's Blue Origin, tested out a magnetized tetrahedron designed to magnetically attach to an asteroid and then passively, magnetically attract and swallow up a sample, no drilling necessary.[xiv] Less than a week later, NASA's OSIRIS-REx spacecraft — the "REx" being short for "Regolith Explorer" — touched down on Bennu, spit out a burst of nitrogen gas to discombobulate its surface, and swept up the resulting dust and pebbles.[xv] In this case, NASA's Goddard Space Flight Center and the University of Arizona teamed up with Lockheed Martin Space and KinetX Aerospace.

Sampling could be viewed as the prelude to mining. On the aforementioned September 10, speaking at a meeting of the Secure World Foundation, Bridenstine clarified the immediate aim of US leadership in space mining: to establish a precedent.[xvi] "We're going to buy some lunar soil for the purpose of demonstrating that it can be done," said Bridenstine. "What we're trying to do is make sure that there is a norm of behavior that says that resources can be extracted." Taking minerals from the Moon or a resource-rich asteroid is completely different from territorial appropriation, he declared. Just like taking tuna from the sea.

Among the dissenters to this America First and Foremost vision of space mining as equivalent to fishing are the Canadian co-founders of the Outer Space Institute, planetary astronomer Aaron Boley and political scientist Michael Byers. In a recent article in *Science*,[xvii] they point out that unregulated taking from the high seas frequently results in decimation of fish stocks. The solution? Sensible nations have negotiated multilateral treaties to manage how much may be taken.

As for the Artemis Accords, Boley and Byers caution that if America's interpretation of international space law prevails, it would "make the U.S. — as the licensing nation for most of the world's space companies — the de facto gatekeeper to the Moon, asteroids, and other celestial bodies." In other words: domination, not leadership. Moreover, international law treats acquiescence as tantamount to consent. Do nothing to impede NASA from buying those grams of lunar miscellany, and you've essentially consented.

Nothing is more long-term or all-encompassing than space, the medium in which we and our planet came to exist and have been fortunate, thus far, to persist. But our entry into it is not environmentally risk-free, either for the celestial objects we encounter or the one we already inhabit.

Take space debris. As Raffi Khatchadourian of the *New Yorker* wrote recently, "We live in a corona of trash."[xviii] It's not just a traffic problem, not just a few documented obstacles to be avoided, but an environmental problem. There are possibly a hundred million one-millimeter fragments quite capable of dinging something important on the International Space Station, and tens of thousands of fragments larger than ten centimeters, mostly the result of collisions, that could terminally damage the ISS. Disturbing moondust during an excavation will produce yet more debris, as will drilling into an asteroid, given the low escape speed of surface material loosened from a small mass with correspondingly low gravity.

And space junk is only part of the problem. Interfere enough with an asteroid and you can change its orbit, for better *or* worse. Unregulated space mining inside a zone of one's own — an Artemis Accords "safety zone" — will not make the environment safer, especially if the site is abandoned once extraction has ended. Certain space actors have already been cavalier about objects and organisms they've launched into the cosmos, including thousands of tardigrades, supersurvivor microbes whose host spacecraft crash-landed on the Moon[xix]; can we be confident these actors will henceforth be punctiliously careful?

On land, sea, and far into space, our environment is under threat. Deregulation is rampant. Earth's ice sheets are cracking and melting. Gorgeous California has been assailed as never before. A catastrophic collision in low-Earth orbit is looking close to inevitable. On the plus side, the European Space Agency has just signed a contract for the first-ever space-debris removal mission.[xx] But there are many more minuses than pluses. Time for humanity to call a halt to deregulation and domination, both down here and up there. Time, too, for a science-minded administrator at NASA, not one focused on extraction, colonization, or domination.

Avis Lang is the coauthor, with Neil deGrasse Tyson, of ACCESSORY TO WAR: The Unspoken Alliance Between Astrophysics and the Military *(W. W. Norton, 2018).*

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