

# EOS

VOL. 102 | NO. 11  
NOV-DEC 2021

SCIENCE NEWS BY AGU

## SCIENCE *is* SOCIETY

Shared insight is how communities  
discover real solutions

**AGU**  
ADVANCING EARTH  
AND SPACE SCIENCE



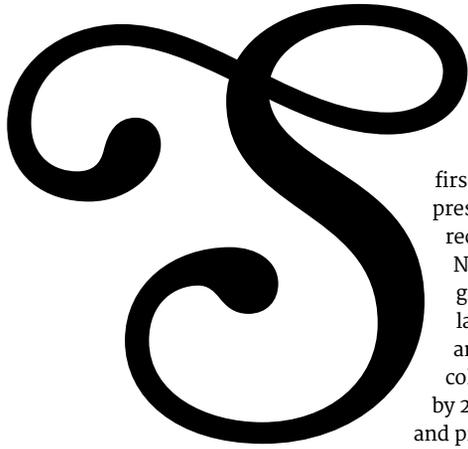
# *Hear Ye! Hear Ye!*

## *A Declaration of the Rights of the Moon*

**BY KATE EVANS**

What are the ethics of mining the Moon? Could humans cause environmental damage to Earth's only satellite? And could a new Declaration of the Rights of the Moon be one way of mitigating those impacts?





Some time this decade, humans will probably stand on the Moon for the first time since 1972. U.S. president Joe Biden recently committed to NASA's Artemis program, which aims to land the first woman and the first person of color on the lunar surface by 2024. Other countries and private companies want to send people, too.

This time, they might take more than photographs and a few rocks.

Mining on the Moon is becoming increasingly likely, as growing numbers of countries and corporations hope to exploit its minerals and molecules to enable further exploration and commercial gain. The discovery of water on the lunar surface has raised the possibility of permanent human settlement, as well as making the Moon a potential pit stop on the way to Mars: Water can be split into hydrogen and oxygen and used to make rocket fuel.

In 2015, the U.S. Congress and President Barack Obama passed legislation that unilaterally gave American companies the right to own and sell natural resources they mine from celestial bodies, including the Moon. In 2020, President Donald Trump issued an executive order proclaiming that "Americans should have the right to engage in commercial exploration, recovery, and use of resources in outer space...and the United States does not view it as a global commons."

Other countries are also interested in exploring our nearest celestial neighbor. In 2019, China landed a probe on the farside of the Moon. Russia is resurrecting its Moon program, planning a series of missions starting in 2022 to drill into the surface of the lunar south pole and prospect for water ice, helium-3, carbon, nitrogen, and precious metals.

Corporations have been plotting out their own ways to claim resources on the Moon, including U.S.-based SpaceX and Blue Origin, and the Japanese lunar exploration company ispace—which, according to its website, aims to mine water and "spearhead a space-based economy." The company also anticipates that by 2040 "the Moon will support a [permanent] population of 1,000 people with 10,000 visiting every year."

But what effects might these activities have on Earth's only natural satellite? Who gets to decide what happens on the Moon?

### **We, the People of Earth**

In a bid to get more people thinking about these questions, and to start a conversation about the ethics of exploiting the lunar landscape for profit, a group of mainly Australian academics have come up with a draft Declaration of the Rights of the Moon, which they hope members of the global public will sign and discuss.

"We the people of Earth," the declaration begins, before going on to assert that the Moon is "a sovereign natural entity in its own right and...possesses fundamental rights, which arise from its existence in the universe." These rights include "the right to exist, persist and continue its vital cycles unaltered, unharmed and unpoluted by human beings; the right to maintain ecological integrity...and the right to remain a forever peaceful celestial entity, unmarred by human conflict or warfare."

Given the acceleration of planned missions and ongoing legal uncertainty over what private companies are allowed to do in space, the authors said, "it is timely to question the instrumental approach which subordinates this ancient celestial body to human interests." Now is the time, they said, to have a clear-eyed global debate about the consequences of human activity in a landscape that has remained largely unchanged for billions of years.

The declaration was penned after a series of public fora organized by Thomas Gooch, a Melbourne-based landscape architect. The discipline of landscape architecture is well suited to having a voice in Moon exploration, he said: "We walk the line of science, art, creativity, nature, and human habitation."

Existing international space agreements address safety, conflict reduction, heritage preservation, sharing knowledge, and offering assistance in emergencies. These are all people-centric concerns; the aim of the declaration is to give the Moon a voice of its own, as a celestial body with an ancient existence separate from human perceptions, Gooch said.

The Moon might not have inhabitants or biological ecosystems—or, at least, we haven't found any yet—but that doesn't mean it is a "dead rock," as it is sometimes described. "Once you see something as dead, then it limits the way you engage with it," said Gooch.

---

**THE AIM OF THE DECLARATION IS TO GIVE THE MOON A VOICE OF ITS OWN, AS A CELESTIAL BODY WITH AN ANCIENT EXISTENCE SEPARATE FROM HUMAN PERCEPTIONS.**

The declaration, as coauthor Alice Gorman sees it, is a position statement to which companies and countries operating on the Moon could be held accountable. Gorman is a space archaeologist studying the heritage of space exploration (and the junk humans leave behind) at Flinders University in Adelaide, Australia.

“Have they respected the Moon’s own processes?” she asked. “Have they respected the Moon’s environment? Some of the time, the answer to that is going to be no, because you can’t dig up huge chunks of a landscape and expect there to be no impact.

“But if that’s the guiding principle, if that’s something that they’re attempting to achieve from the beginning, then that’s surely got to give us a better outcome than if we turn around in 10 years’ time and realize that if you look at the Moon with the naked eye you can see the scars of mining activities.”

### The Dusty, Living Moon

Recent discoveries suggest the Moon is a much more complex and dynamic place than was previously thought, said Gorman.

It has seismic activity, including moonquakes and fault lines. Ancient water ice was directly observed at both lunar poles in 2018, hiding in shadowy areas that haven’t seen sunlight in 2 billion years. “Surely that’s environmentally significant,” said Gorman. “Even in completely human terms, 2-billion-year-old shadows are aesthetically significant.”

Individual water molecules have also recently been identified on the Moon’s sunlit surface, and there may even be a water cycle happening, with the molecules bouncing around over the course of a lunar day.

Gorman is vice chair of an expert group affiliated with the Moon Village Association, an international organization that hopes to establish a permanent human presence on the Moon. “I’m as motivated by the excitement of space science as the most hardcore space nut,” she said.

As such, she recognizes it’s inevitable that human activities—building a village, conducting scientific experiments, or extracting minerals—will have some kind of environmental impact on the Moon. Mining will require extraction machinery, processing facilities, transportation infrastructure, storage, and power sources, Gorman said. “It’s not just, ‘Let’s dig a hole on the Moon.’”

Lunar dust, for instance, is an important concern. Sticky, abrasive, and full of sharp fragments of obsidian, it eroded the seals on Apollo astronauts’ spacesuits and coated their instruments, making data hard to read. It smelled of “spent gunpowder,” gave Apollo 17’s Harrison Schmitt a kind of hay fever, and turned out to be extremely hazardous to respiratory health—the grains are so sharp they can slice holes in astronauts’ lungs and cause damage to their DNA.

Machinery designed to operate on the Moon will need to be resistant to abrasion by the lunar dust. And some research suggests that too many rockets landing on and taking off from the Moon could lift significant quantities of dust into the exosphere. “There’s the potential to create a little dust cloud around the Moon,” said Gorman, “and we don’t yet know enough about how the Moon operates in order to properly assess those impacts.”

### A Space for Capitalism

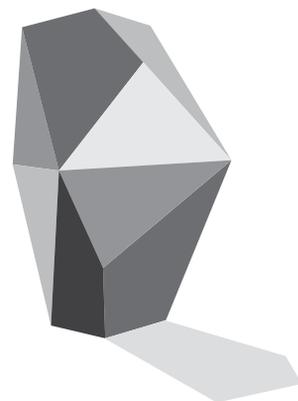
In theory, existing space law should already protect the Moon from commercial exploitation, said Gbenga Oduntan, a reader in international commercial law at the University of Kent in the United Kingdom. Originally from Nigeria, Oduntan was inspired to study law by the fact that nations got together to agree on and create the Outer Space Treaty—a “beautiful” idea that made him “proud of mankind.”

In the treaty, which came into effect in 1967, nations agreed that space (including the Moon) “is not subject to national appropriation by claim of sovereignty” and that “exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind.” For Oduntan, the meaning is clear: Mining on the Moon would be legal if the resources were used for further exploration and scientific research on behalf of all humanity, “but appropriation for sale is a vastly new territory which we cannot allow countries, not to mention companies, to run along with on their own,” he said.

Successive U.S. administrations have had a different interpretation: that outer space is a space for capitalism. In 1979, the United States refused to sign the Moon Agreement, another United Nations treaty that specifically declared that lunar resources were the “common heritage of mankind” and committed signatories to establishing an international regime of

---

**MINING WILL REQUIRE EXTRACTION MACHINERY, PROCESSING FACILITIES, TRANSPORTATION INFRASTRUCTURE, STORAGE, AND POWER SOURCES. “IT’S NOT JUST, ‘LET’S DIG A HOLE ON THE MOON.’”**





New Zealand's Whanganui River is one of a growing number of natural entities that have been granted legal rights. Credit: James Shook/Wikimedia, CC BY 2.5 ([bit.ly/ccby2-5](https://bit.ly/ccby2-5))

---

**“JUST BECAUSE AN AREA IS BEYOND SOVEREIGNTY DOESN'T MAKE IT A GLOBAL COMMONS.”**

oversight when resource extraction was “about to become feasible.” (Lack of support from the major space powers led to only 18 countries signing it, and it remains one of the most unpopular multilateral treaties.)

Instead, in 2015, once extraction actually was about to become feasible, the Space Act explicitly gave U.S. companies the right to own and sell resources they mine from space, as well as 8 more years mostly free of government oversight. (In a 2015 article, Oduntan called it “the most significant salvo that has been fired in the ideological battle over ownership of the cosmos.”)

Scott Pace, a professor of international affairs at George Washington University and director of the U.S. Space Policy Institute, said that legally speaking, space is not a global commons. (In his former role as head of the National Space Council, Pace worked on the 2020 Trump executive order—which also explicitly repudiated the Moon Agreement.)

“Just because an area is beyond sovereignty doesn't make it a global commons,” he said. “Commons implies common ownership and common responsibility, which means...[other countries get] a say in what the United States does out there.”

Instead, the official American view is that “rules on frontiers and shared domains are made by those who show up, not by those who stay behind,” as Pace put it. To that end, the United States has signed nonbinding bilateral agreements—the Artemis Accords—with, so far, 11 other countries that hope to work with the United States on upcoming lunar missions. The accords aim to set norms of behavior for activity on the Moon, Pace said,

although some experts have pointed out that they might also be designed to reinforce the U.S. interpretation of the Outer Space Treaty on resource exploitation.

Oduntan believes that all countries *should* get a say in what happens in space and on the Moon, even countries that are not yet capable of or interested in going there. Such a perspective is not about “exporting communism into outer space,” he said. Instead, the point is to recognize that conflict over resources is inevitable. “Commercialization of outer space in a Wild West mode is going to lead faster to disputes. There will be turf wars. And experience shows us that lack of regulation leads to tears.”

### **Rock Rights**

So could giving the Moon its own rights be one way to provide that kind of oversight and help ensure that countries and companies act in ways that minimize harm to its environment?

The Declaration of the Rights of the Moon was inspired by the growing Rights for Nature movement and uses some of its language. In the past 5 years, some natural entities—like New Zealand's Whanganui River and Urewera forest, India's Ganges River, and Colombia's Atrato River—have been granted legal rights as part of efforts to protect and restore them. (Similarly, some astronomers have been investigating legal action to stop constellations of satellites, like Space X's Starlink, from ruining their observations and altering the night sky.)

Pace was skeptical of the concept and said the Declaration of the Rights of the Moon has no legal standing.

“The idea that the Moon as an inanimate object possesses fundamental rights as a result of its existence in the universe doesn’t make any sense. Rights are something which attach to human persons. We can have an argument about animal rights, but this is saying that there should be something called rock rights—that a lunar rock has a right. It’s an interesting metaphor, but it doesn’t have any legal foundation, and it’s politically meaningless.”

New Zealand’s Whanganui River might now have legal rights, Pace explained, but that’s because those rights were granted by the sovereign government of New Zealand. Countries agreed in the Outer Space Treaty that the Moon was beyond any nation’s sovereignty. That means there is no sovereign power that could legally grant the Moon rights, Pace reasoned—and efforts to have the Moon declared a national park or a World Heritage Site have failed for the same reason. Erin O’Donnell, an expert on water law and the Rights for Nature movement at the University of Melbourne, foresees a different problem. Her research has shown that granting rights to rivers has frequently had unintended consequences for environmental protection.

Depending on the exact legal instrument used, some rivers now have the right to sue, enter into contracts, or own property. “But,” she said, “none of them have rights to water.”

“This is the real tension at the heart of the rights of nature advocacy movement: If something’s not legally enforceable, then it may not necessarily lead to a lot of change, because you can’t rely on it then in situations of conflict.”

Emphasizing legal rights can set up an adversarial atmosphere that can actually make conflict more likely, she said, and even weaken community support for protecting an environment, because people assume that if something has rights, it can look after itself. “If you emphasize the legal rights to the exclusion of all else, you can end up fracturing the relationship between people and nature, and that can be very hard to recover from.”

Where rights of nature movements have had success, she said, is in “reframing and resetting the human relationship with nature,” often by elevating Indigenous worldviews.

### Our Beloved Moon

For Pace, the declaration is premature. Norms of behavior will evolve over time,

he said, once we actually get to the Moon and figure out what we can possibly achieve there.

“What you don’t do is have a group of lawyers, no matter how smart, sit down in a room and try to draft up rules for things that are totally hypothetical. Environmental ethics considerations are rather speculative and not really necessary right now.”

If people really want to have an influence on space policy, Pace said, they should lobby their governments to get involved in the new space race. “Make sure you’re at the table. It sounds blunt, but the rules are made by the people who show up. Find a way to get in the game, and then you have a say.”

Oduntan, O’Donnell, and Gorman disagreed. “By the time there’s a problem, it’s massively too late,” said O’Donnell. “We see that in the case of the rivers every day. All of the rivers around the world that have received legal rights are beloved, but heavily impacted.” The Moon is beloved, too, she said, but is as yet undamaged. “It would be nice if in this case we could act preventatively.”

The Declaration of the Rights of the Moon may not result in any legal outcomes, O’Donnell said, but it’s “a really important conversation starter.”

Most of us will never walk on its surface, but all human cultures tell stories about the Moon. It lights our nights, is a presence in our myths and legends, powers the tides, triggers animal (and, in limited ways, human) behavior, and marks the passing of time.

“The more of us who talk about these kinds of things,” said O’Donnell, “the more we’re likely to normalize seeing the Moon as something other than a piece of territory to be fought over by nation states and corporate investors.”

Supporters of the declaration want to democratize that conversation and give everyone a chance to take part.

“Every single person on Earth has a right to have a say in what happens to the Moon,” said Gorman. “It’s important for the environments in which we live, and for our cultural and scientific worldviews. It really does not belong to anyone.”

### Author Information

**Kate Evans** (@kate\_g\_evans), Science Writer

► Read the article at [bit.ly/Eos-Moon-rights](https://bit.ly/Eos-Moon-rights)

---

**“THIS [DECLARATION] IS SAYING THAT THERE SHOULD BE SOMETHING CALLED ROCK RIGHTS— THAT A LUNAR ROCK HAS A RIGHT. IT’S AN INTERESTING METAPHOR, BUT IT DOESN’T HAVE ANY LEGAL FOUNDATION, AND IT’S POLITICALLY MEANINGLESS.”**

