

Buddhists Do Not Want Space Junk to Fall on Your Head

Written by Daniel Capper

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DANIEL CAPPER, AUG 31 2023

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It is well known that space travel is an inherently international exercise. The resources required and complications encountered in off-Earth sojourns often demand multinational cooperation for their management. Even when operating alone, though, national space programs like NASA in the United States or JAXA in Japan still employ multinational staffs so that they may enjoy the work of the best and brightest. Rocket launches are common these days and each one is a testament to international cooperation, with a variable helping of international competition thrown in the mix, too.

Less recognized are the environmental problems posed by space travel and their widespread international effects. Human beings with no connection to space programs have been harmed by falling space debris. Additionally, the glut of obsolete hardware in orbit notably fouls the views of both radio and optical astronomers despite the existence of students of the cosmos in every country. Perhaps most dramatically, a gold rush to mine our moon currently unfolds, and just like terrestrial miners, moon miners can level entire mountains. This could result in the erasure of the figure known to Westerners as the “Man in the Moon,” and every human being forever after will be able to witness this cultural as well as ecological destruction. A number of environmental issues in space, like the orbital debris or lunar mining that I have mentioned, impact all humans and therefore remain inherently international in character and concern.

Unfortunately, as commonly appears, in this case our technological development outstrips our ethical development for using that technology. Hence, despite the severity of space environmental issues that we face, little has been done to provide positive policy guidance that is ethically grounded. Even when scholars have tried to create such guidance, moreover, efforts have been hamstrung by some traditional moral codes that are in many ways unprepared for tackling space age issues, especially environmental issues like how to value and protect non-living things like our companion moon or the startling rings of Saturn.

Recent environmental ethics research undertaken among Buddhists, however, helps us to see space-related moral issues more clearly. Additionally, this research overcomes some obstacles to our development of space travel morality. Along with a control data set from the general public, American Buddhists from across all three major sects of Theravāda, Mahāyāna, and Vajrayāna completed a space ethics survey, and the results of this survey, when combined with traditional Buddhist teachings, provide innovative new directions for resolving ethical problems in space. As described in my book *Buddhist Ecological Protection of Space: A Guide for Sustainable Off-Earth Travel* (2023), Buddhists from the contemporary ethnographic field clarify the appropriateness of our extraterrestrial actions involving the managing of space debris, the proper mining of our moon, the handling of off-Earth microbes that may be discovered in the future, and the overhauling of the climates of planets like Mars as proposed by people like Elon Musk. As I will explain more, Buddhist ethics from the field can help to guide us to a cleaner and more responsible presence away from Earth.

An interesting theme that emerged in the course of the research involves an *ad hoc* construction of an ethic of

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nonharm-in-interconnection, and this ethic ended up grounding all Buddhist space moral responses. This ethic of nonharm-in-interconnection, as employed in this case, cannot be found directly in Buddhist scriptures, and it does not seem to be an artefact of the survey instrument. Instead, it arises organically from the collective voices of grassroots Buddhists. That said, this ethic of nonharm-in-interconnection conjoins features of the tradition that long have been prominent among and treasured by Buddhists of different stripes. A philosophical cornerstone of Buddhism, after all, involves the notion of the utter interconnectedness of the physical universe across space and time. Called “dependent arising” in English or *pratītya-samutpāda* in the scriptural language of Sanskrit, dependent arising recognizes that everything phenomenal arises from one or more causes, so that nothing at all is fully independent despite possible appearances to the contrary. A classical Buddhist image of dependent arising involves a tripod made of three sticks that lean against one another. Take one stick away and the tripod disappears, so that the tripod, rather than being an independent entity, arises only because of specific time-and-place interactions between the sticks. The tripod is inherently interconnected with the sticks in terms of time and place. And if we trace the origin of the sticks back to the Big Bang, we see that the tripod is inherently interconnected across time and space with everything else in our phenomenal universe.

Buddhists from the field strikingly married this fundamental Buddhist metaphysical notion of dependent arising repeatedly with the same value; that of non-harm or *ahimsa*, commonly found in religions from India. Eschewing Buddhist values like compassion and loving-kindness in favor of non-harm, informants specifically wielded non-harm as a value which, with intention, they then blended with ideas of interconnection for approaching each space environmental issue. That is, for these Buddhists, we should extend non-harm to our moon, whether it is living or not because we are interconnected with it. Intriguingly, classically Buddhists employ non-harm with living beings in mind, but innovatively these Buddhists applied non-harm to the nonliving landscapes of our moon and, as we will see more, of Mars as well.

The fraught problem of space debris, which I have mentioned, offers a nice window into the types of ethical contributions engendered by this Buddhist ethic of non-harm-in-interconnection. Since the 1950s we have sent massive amounts of hardware into space, yet not one bit has been cleaned up. What this means is that we currently suffer from a thick layer of space debris that orbits our planet at high speeds. Space debris includes the spent fuel stages that we all have seen rockets eject in tandem with congealed aluminum oxide slag from solid rocket engines. Intentionally placed trash, such as lens caps from cameras or refuse released from a space station, count as debris, as do unintentional elements like parts lost in the construction of the International Space Station. There currently are more than 20,000 large chunks of this debris in orbit. Since tracking objects less than 10 cm in size is difficult, it is estimated that there are more than 100,000 human-fabricated particles in orbit between 1 and 10 cm in size, with tens of millions of fabricated particles that are smaller than 1 cm.

Since pieces of space debris in orbit can travel as fast as 10 kilometers (6.2 miles) per second, a space debris shard as small as a centimeter wide creates the explosive power of a hand grenade on impact. As the space security analyst James Clay Moltz states, “A collision between any sizable piece of orbital debris and a spacecraft would likely cause catastrophic damage and, for manned missions, almost certain death.” This debris threatens astronauts in the International Space Station in reality, not just in the fiction of the movie *Gravity*, and also threatens beings on the ground. For instance, upon reentry into the Earth’s atmosphere, the Russian military satellite Cosmos 954 left a trail of uranium 235 in solid form scattered across a swath of western Canada. This radioactive load threatened water and food supplies for the indigenous Inuit and Ojibwa people who lived near the crash site. As an additional problem, although humans typically describe falls of space debris into the sea as “harmless” events, the fact is that the ocean floor becomes polluted from sunken space hardware, negatively affecting underwater landscapes and the marine beings who live there.

Buddhists from the field offer us our most complete response to date to these challenges spawned by space debris. They do so specifically by relying on the nonharm-in-interconnection ethic that I mentioned previously. Crucially, Buddhist informants insist that humans must take responsibility for the space junk that they have created. Although this point may seem banal, this sense of responsibility greatly contrasts with the foot dragging and finger pointing that to date have doomed other campaigns to confront space debris. Additionally, these Buddhists demand that moral concern be extended not just to human beings who may suffer negative consequences from debris but also to

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nonhuman beings as well, such as the whales and sea turtles who have their lairs ruined by poorly managed space hardware. This extension of concern philosophically arises naturally from the way that these Buddhists understand the interconnectedness of dependent arising. But it also leaves their response to space debris in satisfying consonance with the influential notion of environmental justice in terms of the avoidance of intersectional “socioecological inequality” as delineated by the environmental scholar David Naghib Pellow in *Total Liberation: The Power and Promise of Animal Rights and the Radical Earth Movement*.

Another space ecological concern of international import involves the mining of our moon, as I have mentioned. The Trump era resulted in the space policy outcome of the Artemis Accords, which the United States government continues to aggressively press. The Artemis Accords join numerous national space programs together with private entities like SpaceX and Blue Origin in order to commercialize the moon today so that it can support human-staffed traffic to Mars tomorrow. Central in the lunar element of this plan is mining for various substances. NASA’s Clementine mission discovered water ice, for instance, which exists in some quantities inside permanently dark craters at our moon’s poles. This water can support human life as well as be turned into rocket fuel. Miners also covet rare Earth metals, especially those of the platinum family. Finally, some miners seek the energy source helium-3. The isotope known as helium-3 in theory produces no nuclear waste when fused with itself, promising clean power to citizens of Earth. Helium-3 exists on our moon but not on Earth, though, so that people who can mine, process, and/or fuse lunar helium-3 may be in line for space riches.

Of course, a problem here is that any mining carries the potential for considerable ecological destruction. The astronaut and helium-3 prospector Jack Schmitt states that the city of Dallas in the United States could be provided with a year’s 1,000 megawatt power with “two square kilometers of large portions of the lunar surface, to a depth of three meters, [which] contains 100 kg of helium-3.” The helium-3 must then be processed out of the mineral before it can be collected and shipped, since Schmitt relates that only 100 kg of helium-3 results from grinding “10 million tonnes of regolith.”

If we project these numbers in terms of an active helium-3 industry, at the time of this writing worldwide there already are 385 cities at least the size of and with the energy needs or greater of Schmitt’s example of Dallas. Of course, there also exist innumerable smaller human municipalities. With at least two square kilometers per city processed to a depth of three meters per year, the area mined really adds up, consisting of at least 770 square kilometers destroyed just for Dallas-sized municipalities and just for one year’s worth of energy.

Making this situation worse, the moon cannot heal itself because it lacks weathering and tectonic dynamics, so that damage to its surface theoretically lasts forever. This danger not only affects the lunar surface, though, because it also affects human cultures and lives. For instance, leveling the Apennine Mountains on the moon through mining would eliminate the nose of the figure historically treasured by the Roman writer Plutarch as the Woman in the Moon or by contemporary Westerners as the Man in the Moon, thus harming human cultures while also spoiling the view from our back yards. How is it fair if a lunar mining company ruins the view as well as the cultural meanings of our moon for everyone else?

Buddhists respond to these lunar ecological conflicts by relying on their own innovative theorizing while adding a dash of Buddhist history. Historically, Buddhists may have been among the first in the world to establish nature sanctuaries, as such appears to have been done during the lifetime of the Buddha in India around 500 BCE, when a follower of the Buddha named Vassakāra initiated a reserve to care for monkeys with park rangers. Buddhists in this study tap into that tradition. Notably, they also extend nonharm-in-interconnection to the lunar landscape despite its lifeless nature, thus embracing a more eco-centric orientation than Buddhism’s traditionally life-focused ethics. The result is an environmental ethical proposal to establish protected areas on our moon which prohibit mining as well as open areas that allow commercial pursuits. In this way the scientifically important Daedalus Crater on our moon’s far side, the best place in the inner solar system for a radio telescope, can be preserved from errant mining. Places of ecological magnificence, such as the great peak Mons Malapert, can remain pristine for future generations to behold and the cultural preciousness of the Man in the Moon can remain intact, all the while without an absolute prohibition of mining.

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The famous Buddhist cherishing of life manifests differently, if fascinatingly, when it comes to the ethical treatment of potential Martian microbes. Leaving aside pop culture images of little green people, in a hard science vein it seems likely that microbial life may be found somewhere in our solar system, where the ingredients for life are bountiful. Candidate locations include Jupiter's moon Europa, Saturn's moons Enceladus and Titan, or in a protected location underground on Mars. Hardware is being developed to seek tiny life in these hard-to-explore spots.

Presuming that this search eventually will be successful raises a host of moral questions. Using Mars as an example discovery location, how should we treat living Martian microorganisms? How should we treat their habitats? Can we kill a few microbes so that we can study them and possibly dramatically advance genetic medicine?

Turning to the Buddhist rules for monastics, the *Vinaya*, provides some intriguing answers to these questions despite the antiquity of the monastic code. One monastic vow involves *ahimsa*, or non-harm, as we have already seen in this essay. In this case, *ahimsa* means extending non-harm as much as possible toward any living off-Earth microorganisms that we may find. Another Buddhist monastic rule against using bodies of water that may contain tiny life supplies a platform for extending non-harm not just to microbes but also to their habitats. All this said, the central, anthropocentric stream of Buddhist ethics allows the use of nonhuman resources if such will reduce human suffering, as is the case in a scenario involving the possible advancement of genetic medicine. Thus, one may argue from monastic rules such as those that govern the harvesting of plants that killing some Martian microbes in the name of science is acceptable as long as the harm to microscopic beings is minimized. That is, Buddhist monastic values supply a practical moral code for use by astronaut-scientists that nonharm to microbes and their habitats must be followed as much as possible, but limited scientific harvesting of living beings also is acceptable as long as pursued with a minimum of destructiveness and suffering.

A final way that Buddhist environmental ethics can guide us in space may bother Elon Musk, a founder of SpaceX. Recognizing environmental devastation here on Earth, Musk says that humanity has no choice but to become a two-planet species by moving to Mars. Mars being too cold and radiation-prone to support much human life, though, Musk advocates planet-wide ecological manipulation, also known by the poor moniker "terraforming." So goes Musk's theory, by detonating nuclear weapons deep in Mars' crust, we release frozen CO₂ and other greenhouse gases, thus warming Mars wholesale via the greenhouse effect. As related by Christian Davenport in *The Space Barons*, Musk thinks that over time temperatures will become more reasonable on a human scale, water ice will melt, and the agricultural production of food for settlements can occur, thus making Mars into an ideal ecological lifeboat for humanity.

There are several problems with this view. Sufficient gas does not seem to exist on Mars nor does a technology to extract it if it did. Moreover, Mars will constantly lose its artificially created atmosphere because it still will lack a magnetic field. There is also the obvious retort from the Astronomer Royal of Britain, Sir Martin Rees, that it is better to repair humanity's home planet than it is to give up and flee. Finally, the space ethicist Tony Milligan highlights another difficulty: permissibility. If it is not ethically permissible to manipulate a planet's ecology wholesale rather than piecemeal then, morally speaking, Musk must give up his Mars-as-lifeboat plan.

Buddhists from the field interestingly if resoundingly deny Musk this moral permissibility. Two-to-one Buddhists said "no" to the permissibility of planet-wide ecological manipulation of Mars despite the lack of life on the Martian surface. Buddhists did so by extending their nonharm-in-interconnection sensibility not to living beings but to the structural integrities of Mars' features. An environmental ethicist will be fascinated to find that, collectively if in *an ad hoc* way, Buddhists replaced the commonplace living/nonliving binary of ethical valuation with attention to interconnection instead. In the eyes of these Buddhists, because they are interconnected with Mars, that planet must be protected as it is, so Musk will need a new plan to replace his goal of the planet-wide ecological manipulation of Mars.

In generating these moral perspectives, Buddhists in this study spotlight a beauty of proactive space environmentalism. Due to climate change, no place on Earth can be preserved in a pristine condition, but the vast majority of our off-Earth environment can be left relatively untouched by humans, if we think and plan ahead. Of course, our orbital paths are already fouled by space debris, but Buddhists argue for the sense of responsibility as

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well as the orbital recycling centers needed to clean up our space junk. On the moon, though, Buddhist moral perspectives may result in protective reserves for lunar places of ecological magnificence or compelling scientific value, thereby proactively preserving them from commercial pursuits. Of interest, Buddhist environmental ethics also can support the scientific search for life through a tripartite ethic of nonharm toward microbes, nonharm toward microbe habitats, but also limited harvesting of microorganisms for science as long as that harvesting is pursued as respectfully and nondestructively as possible. Finally, Buddhists proactively wish to keep Mars as it is today as much as possible whether or not this moral vision provides an obstacle to a notable space mogul. In the end, several environmental issues connected to space travel impact all humans regardless of nation, and the Buddhists in this study supply some satisfying pathways for protecting off-Earth realities for the benefit of all human (and, it is hoped, nonhuman) beings in all countries.

About the author:

Daniel Capper is a Professor at the University of Southern Mississippi and Adjunct Professor at Metropolitan State University in Denver. His interdisciplinary research explores environmental ethical interactions with the nonhuman natural world comparatively as well as among Buddhists. Capper's many publications, which include the study of ecological dynamics in space in addition to on Earth, include the books *Learning Love from a Tiger: Religious Experiences with Nature*, *Roaming Free like a Deer: Buddhism and the Natural World*, and *Buddhist Ecological Protection of Space: A Guide for Sustainable Off-Earth Travel*.