

## **Regulating Human Activities in the Final Frontier: Towards a Nature-Centered 'Space Jurisprudence'**

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The ways in which humans access, occupy and utilize outer space are changing quickly. While our species first achieved a presence in space nearly seven decades ago, the landscape of spaceflight little resembles that of its early days. The “Space Race”, contested principally between the United States and the Soviet Union, dominated its first decade. The U.S. Moon landings demonstrated the reach of human spaceflight and promised a future in which humans would go to Mars and beyond within a few generations. The next 40 years, commencing with the U.S.-U.S.S.R. Apollo-Soyuz Test Project in 1975, saw increasing cooperation among states, even those who viewed each other as competitors (or even political adversaries). But the relatively high cost of launching payloads into space kept the number of satellites and human space missions low.

Incrementalism gave way to rapid expansion of private space activities in the mid-2010s in what is sometimes termed “NewSpace” (Kreisel and Lee 2008). Entrepreneurship led to an unprecedented increase in the use of outer space for private commercial activities. It is a shift away from the conventional model of states tending to launch single spacecraft to private entities launching thousands of them, facilitated largely by plummeting launch costs (Jones 2018). This makes space reachable by more companies who see many opportunities ripe for commercial exploitation, including extracting minerals from the Moon and asteroids; In-Space Assembly and Manufacturing (ISAM); custom remote sensing data collection; and even orbital advertising. (Kulu 2021)

As outer space, and especially the orbital region near the Earth, continues to fill with new spacecraft and discarded launch hardware, risks associated with spaceflight are increasing (Schaub et al. 2015). The probability of collisions between and among objects in orbit is rising. One collision between satellites can generate thousands of pieces of trackable debris (Wang 2010). Military uses, including destructive anti-satellite weapons tests, further exacerbate the collision threat (Gunasekara 2012). Some argue that runaway debris cascades could yield

conditions that effectively close low-Earth orbit (LEO) space to new spacecraft either occupying or transiting through LEO (Kessler and Cour-Palais 1978).

The current international legal framework governing human activities in space descends from the Outer Space Treaty of 1967, or “OST” (UN 1967). As of February 2023, 112 countries are parties to the treaty and another 23 are signatories. Four separate UN conventions follow from the articles of the OST, which many state parties have ratified. The parties implement their treaty obligations through national laws that govern activities in space that launch from their territories, and their delegations meet regularly under the auspices of the UN Committee on the Peaceful Uses of Outer Space (COPUOS) to debate resolutions and adjudicate disputes.

However, the prevailing uses of outer space at the time the OST was framed in the early 1960s are increasingly out of step with both current uses and those anticipated in coming decades. The OST does not address some kinds of activities, such as resource extraction on the Moon and other Solar System bodies. The decision-making process at COPUOS is based on a consensus model and very slow to react to the rapid pace of change seen in recent years. As a result, there has been little in the way of formally codified regulation since the 1970s. Much of the practical governance of space for commercial development has instead relied on voluntary adherence to industry best practices. As nations plan a future space economy, an increasingly *laissez-faire* attitude dominates. There seems to be little appetite for expanding protections against abuses; rather, faith in technical solutions to problems has ushered in an era of ‘space sustainability’ that indirectly encourages the ever more intense exploitation of space resources. An example of this sense of faith in innovation to make space sustainable is the notion that the pursuit of space domain awareness and active debris removal obviate any sense of exigency about the rapid crowding of LEO space (Plattard and Smith 2021).

A key element of the OST is a general prohibition of territorial claims by states in space. This insistence frames outer space as a legal *terra nullius*. But contrary to the historical interpretation of that principle, the OST explicitly enjoins against territorial appropriation “by means of use or occupation, or by any other means” (Article II). Examples of how governance proceeds from this idea are the Antarctic Treaty (UN 1959) and the Law of the Sea (UN 1982). Some argue that this view of outer space as a “nobody’s land” must be re-examined on the premise that the status quo will be effectively impossible to enforce once a significant expansion of the direct human presence in space has occurred (Erlank 2015). Others suggest doubling down on the present regime and establishing a new global legal framework that would ultimately supersede the OST and formally extend principles of terrestrial law to the new jurisdiction of outer space (Soroka 2020).

The prevailing form of civil law throughout the world presumes humanity holds an inevitable lordship over the natural environment and is free to exploit its resources indefinitely (Feichtner

and Ranganathan 2019). If this view holds as humanity begins to commercially develop space in earnest, our species risks repeating the same actions that have led to significant environmental degradation on our home planet. It is a manifestation of the theory of the “tragedy of the commons” (Hardin 1968), in which self-interested actors unbound by law, regulation or custom foul or deplete a resource otherwise accessible to all. Such an outcome clearly runs counter to both the spirit and the letter of the OST and the international commitment it represents.

An alternative to this view is one in which the concepts of Earth jurisprudence are extended to outer space on the presumption that space is an extension of the terrestrial environment by virtue of humanity’s presence there. That presence leads to the potential for humans to affect conditions in space, such as pollution of the space environment with anthropogenic debris and the modification of planetary surfaces by both humans and their robotic emissaries. It is arguable that “human activities”, including those linked to warfare, are already being conducted in space (Johnson-Freese 2016; Pražák 2022).

This leads us to ask a number of questions, including the following:

- Should international space law rest upon *jus cogens* norms?
- As an extension of the ‘human environment’, does outer space have some kind of intrinsic legal status?
- Can any of this be meaningfully enforced?

It also prompts us to think ahead by imagining a permanent human presence at least on the Moon and Mars, and perhaps elsewhere in the Solar System, by the end of the 21st century. We should be mindful about the potential for causing irreparable harm to places that have been heretofore unreachable by humans; one commonly cited example is the likely biological contamination of putative and ‘pristine’ oceans beneath the icy surfaces of certain moons by landing spacecraft (Rettberg 2019). Such incidents, if realized, may impede or prevent scientific discoveries on such worlds and could commence uncontrolled terraforming experiments. On worlds like Mars, where native organisms may exist, human activities could alter their evolutionary trajectories or extinguish life altogether. These considerations raise deeply troubling ethical concerns (Mautner 2009).

To the extent that such possibilities resemble terrestrial environmental disasters, we might further ask whether legal reform can prevent such disasters in space. Some scholars call for adopting a sense of human ‘stewardship’ of the space environment that could guide the development of such policies (Heim 2019). Yet there is presently no consensus on how terrestrial law would apply in those places, whether toward the environment or between and among humans (Chatzipanagiotis 2016). And already, certain private commercial actors unilaterally assert that no terrestrial laws govern their activities elsewhere in the Solar System. For example,

in the terms of service for its Starlink satellite Internet service, the U.S.-based Space Exploration Technologies Corp. insists that “for Services provided on Mars, or in transit to Mars via Starship or other spacecraft, the parties recognize Mars as a free planet and that no Earth-based government has authority or sovereignty over Martian activities.” (SpaceX 2020).

In order to develop space consistently with the OST and its demand that “the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries,” (Article I) we argue for a rethinking of the global space policy status quo. Mirroring the principles of Earth jurisprudence, a truly sustainable ‘space jurisprudence’ would not begin with the premise that space is an endlessly inexhaustible resource meant for human exploitation. There is no reason to believe that repeating the historical development of anthropocentric terrestrial law in space will obtain better outcomes for either humans or the ‘human environment’ of space. Instead, granting an elevated legal status to the otherwise pristine space environment above its purely material resource value may be the only route to ensuring that the resource remains available to all. While we no longer have the option of treating the Earth as a legal *tabula rasa*, humanity stands poised on the shores of the cosmic ocean with the prerogative to make good decisions still well in hand.

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