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## Accounting for non-humans in space exploration

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### ABSTRACT

The human 'conquest' of outer space has relied upon an array of human-made objects and technologies and earth-born animals and plants that have been involved in the exploration of our planetary outside. These living and inanimate non-humans are important participants in space exploration, yet their extra-planetary presence is insufficiently articulated within the global registers of space law and policy. This paper explores the legal context and ethical issues surrounding their presence in space, suggesting that these nonhuman space explorers warrant attention and nuanced responses which would address their participation in the progression of our futures in space.

### 1. The silent cast of the space age

Space exploration propelled human presence and activities beyond the globe, allowing us to steadily extend our ways of life into an environment which is, in essence, a distinctly 'inhuman' space. Thousands of launches have sent various missions into the extraterrestrial unknowns, transforming outer space into what the United Nations' Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, also known as the Outer Space Treaty (OST), envisioned to be 'the province of all mankind' [1].<sup>1</sup> Designating outer space as a shared domain of the global commons, the OST placed astronauts as the pivotal point in the purview of its exploration, declaring them 'envoys of mankind in outer space' [1]. And yet, astronauts, and humans in general account for only a fraction of those who have left the planetary confines of the Earth; thus far, only about five hundred people have travelled into outer space [2] to partake in sub-orbital or orbital flights, lunar missions and research projects conducted at the space stations.<sup>2</sup> The majority of

participants in the human exploration of space are non-humans – myriad earth born animals, plants and human-made objects, artefacts and technologies.<sup>3</sup> Over six thousand satellites, around a hundred space telescopes and several space stations have been placed into earth's orbital regions and various 'unmanned' orbiting, landing, roving and flyby probes are sent further still to explore a range of celestial bodies, phenomena and events. Numerous animate organisms are also dispatched to space on our behalf, from fruit flies, dogs and monkeys onboard early rockets to a menagerie including microbes, insects, amphibians, avians, rodents and various plants which are involved in experiments onboard the International Space Station (ISS). Although these animate and inanimate non-humans are playing a substantial role in the transformation of outer space into humankind's province, introducing and asserting the biological, social and technical registers of the terrestrial arena of life outside the boundaries of our own planet, their status and exploits are insufficiently articulated within the global legal and policy frameworks surrounding space exploration.<sup>4</sup>

This is not to say that non-human space explorers have been entirely

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<sup>1</sup> The Outer Space Treaty formulated a vision of peaceful, cooperative and responsible exploration and use of outer space that would benefit the whole of humanity. The legal tenants outlined in the main text of the Treaty were subsequently expanded through several agreements; these are the Agreement on the Rescue of Astronauts, Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement, 1968), the Convention on International Liability for Damage Caused by Space Objects (Liability Convention, 1972), the Convention on Registration of Objects Launched into Outer Space (Registration Convention, 1978) and the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement, 1984) [3–6].

<sup>2</sup> This select group is comprised of mainly astronauts and members of mission crews and also a number of civilians and industry representatives, including several commercial space tourists who visited the International Space Station (ISS) during the last couple of decades.

<sup>3</sup> The space age itself commences with non-humans – Sputnik's launch in October 1957 marked the official beginning of the space age, and several weeks later, a dog named Laika became the first living being from Earth to orbit the planet. While space technologies have been largely catalogued and most of their launches entered into the United Nations Register of Objects Launched into Outer Space, the number of living non-humans that have been sent to space is substantial, yet uncertain, as there are no equivalent data collection requirements and facilities.

<sup>4</sup> Contemporary intellectual thought on the 'non', 'post' and 'more-than human' ambits of the human condition emerges from the writings of Donna Haraway, Katherine Hayles, Gilles Deleuze, Bruno Latour, Rosi Braidotti and Sarah Whatmore and finds its expression within a range of inquiries into new materialism, animal studies, object-oriented philosophy and actor-network theory.

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overlooked - all ‘things’ sent in outer space are broadly classified as ‘space objects’ and a range of issues concerning their presence in space such as their status of property for which their owners are responsible and liable have been addressed in the OST system. While no particular kind of flora and fauna is directly mentioned, the Treaty’s Article IX refers to organic forms of life in the context of potential harmful biological contamination that could occur in exchanges between the terrestrial and extraterrestrial environments [1]. Since OST statutes entered into force, a range of policies, protocols and guidelines that expound upon the particulars of non-humans’ involvement in space exploration have been established by governments, space agencies, inter-agency organisations, international bodies and private space companies. NASA has developed its Principles for the Ethical Care and Use of Animals [7], and the Inter-Agency Space Debris Coordination Committee have been updating its Space Debris Mitigation Guidelines since 2007 [8] – indirectly affirming technological waste left by space exploration as a distinct kind of ‘space object’. Yet, unlike astronauts who are considered the emissaries of humankind, those terrestrial beings and objects of non-human kind are not assigned such a representative status. Instead, they are contained in the global ambit of space law and policy as a side-issue of space exploration, conceived as its necessary means that also pose ‘potential problems’ (ethical, techno-scientific or material-economic) to its human-directed progress which require procedural management and ‘mitigation’. Such conceptualisation renders the non-humans into mere instruments of our progress in space – while they are in fact themselves ‘instrumental’ in establishing and sustaining the extraplanetary domain as a human province.

This lack of non-humans within the current legal and policy registers surrounding global approaches to outer space is part of a larger problematics surrounding both our efforts to relate to its alien expanses and also the ongoing challenge of how to codify and formalise our ‘recognition’ of nonhumans in general. The momentum of the space age leaves us, as Harold Goodwin wrote, with ‘an inadequate vocabulary’ [9]. This is most apparently reflected in the vocabulary of space law and policy, the development of which thus far has not been able to keep pace with our extraplanetary advances; concepts such as ‘space situational awareness’, ‘space debris’ and ‘space tourist’ are all without agreed-upon definitions let alone a clearly defined legal status [10–13]. The question of non-humans is one of such disturbances in language that accompanies our progress in space. On earth, non-humans of both the animate and inanimate kind have been gradually recognised as productive participants in biological, technical and social processes that sculpt the gamut of human life.<sup>5</sup> If non-humans are seen as significant for life on earth, they are even more important for expanding its currents beyond the planet. This significance extends beyond the techno-scientific preoccupations with innovation and progress onto a range of legal, political, economic, cultural and ethical issues surrounding space exploration [15–20] and in this sense, their structural absence from the OST is a notable lack which indicates a particular governmental lacuna. It is symptomatic of what Stephen Pyne calls the ‘third age’<sup>6</sup> of geographical discovery which focuses upon the extremities of the planet and its surroundings [15,16] and encounters with ‘new worlds’ which were ‘previously uninhabited or visited by humans’ [21]. As a part of the ‘third age’ of discovery, space exploration necessitate ‘dramatically different’ approaches of transcending not only its ethnocentric origins but also its anthropocentric orientation [21].<sup>7</sup> In this sense, accounting

for these earth-born or human-made non-humans and the ways in which their status and contribution is recognised in space law and policy, becomes crucial for affirming the vision of space exploration as shared, collective endeavour and shaping the cosmic horizon of ‘more-than-human world’ [14].

As further space launches are accomplished, new spacefaring nations inaugurated and novel international, commercial and public-private ventures in space initiated, a more and more-diverse pool of non-humans are sent out to reinforce the extraterrestrial progression of human societies, such as Robonauts and *Sphaerocystis* algae, which have been recently involved in projects on the International Space Station. Their centrality to processes and practices which seek to buttress our extra-planetary prospects affords them a particular status, one which arguably necessitates additions and reconfigurations of global legal and ethical platforms. Acknowledging the participation of these non-humans would shape the direction of our future in space, and give form and language to the complex relationships that will continue to configure our shared making and remaking of the ‘more than human world’ beyond the boundaries of the earth. As the possibility of encountering ‘new worlds’ actually becomes literal, and as such encounters become increasingly shared with nonhumans, it seems fitting that our classifications and systems of law and ethics reflect and acknowledge the roles played in space by these heralds of a global collective. Expanding upon this proposition, this paper explores the legal and politico-ethical circumstances that condition the extraterrestrial presence of nonhumans from earth. In overviewing how we define their status within the global statutes of space endeavour, it suggests that they too can be framed as our global ‘envoys’ – and more precisely, that part of thinking our extra-planetary progress requires formal and conceptual gestures which would account for those non-human space explorers that advance our shared futures beyond the planet.

## 2. Configuring ‘things’ in space

Aside from humans, space exploration has mostly relied upon various objects and things – an array of nonliving matter that has been techno-scientifically organised into the material infrastructure that sustains its momentum. If inanimate objects, in particular human-made technologies, are inseparable from, and themselves constitute a gamut of our terrestrial ways of life [37,38], then they are also vital in its extension into outer space. Their apparent indispensability in converting the extraterrestrial environment into a human domain is in a way validated in the OST. Their presence in space is not only addressed in the Treaty’s main text, they also take a prominent place in the Rescue Agreement [3], the Liability Convention [4] and the Registration Convention [5]. Like astronauts, they have also been given a distinct designation while residing in space – they are considered as ‘space objects’. The definition of this term is provided in Article 1 of Liability Convention which elaborates upon Article 7 of the OST, stating that it ‘includes component parts of a space object as well as its launch vehicle and parts thereof’ [4]. Such broad classification does not develop any nomenclature for the wide range of space objects that fall into this category. Aside from banning weapons of mass destruction beyond the earth, international space law does not make any distinction between different objects that humans have placed in space – whether between their type, purpose or operative conditions and encompasses anything

(footnote continued)

space objects and to ensure, in particular, the prompt payment under the terms of this Convention of a full and equitable measure of compensation to victims of such damage’ [4]. Damages caused by space objects are not rare. While most deorbiting satellites and their debris will burn in the atmosphere, some fall back to earth such as the Skylab station that in 1979 crashed on the Western Australian coast, and some remain in orbit and pose a threat to operational space objects such as satellites and the ISS, which occasionally get struck and damaged by debris. However, the liability principle has been thus far only enforced once, in 1978, when the Russian RORSAT Cosmos 954 satellite fell in Canadian territory, prompting a claim and settlement for damages [41].

<sup>5</sup> Pyne conceptualises the ‘third age’ of discovery as the period following the great age of maritime discovery and the period of exploration (and colonial exploitation) of non-European continents [15,16].

<sup>6</sup> While the OST in a way overcomes the ethnic and nation-centric gravities of human organization, envisioning outer space as the global commons and its exploration as a pursuit which aspires to benefit the continuum of humanity as a whole, it does not dispense with the anthropocentric lens.

<sup>7</sup> As indicated in the Convention’s Annex, this was a response to ‘the need to elaborate effective international rules and procedures concerning liability for damage caused by

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