Outer Space, New Tech and Future Space Settlement: Human Rights for the Final Frontier: Virtual Conference

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Book of Abstracts

Note: Abstracts in this booklet have been arranged in alphabetical order according to the presenters' surnames.

This virtual conference will take place at the University of Waikato in partnership with the AI and Space Law Society which aims to create an all-encompassing discussion on the topic of outer space and human rights.

This conference is being organised by Dr Anna Marie Brennan with support from the Michael and Suzanne Borrin Foundation through a Women Leaders in Law Fellowship. The Borrin Foundation "supports legal research, education and scholarship that contributes to a just, inclusive and flourishing Aotearoa New Zealand."

For further information on the conference, please email: abrennan@waikato.ac.nz

The Right to a Healthy Environment on Earth and Beyond: Ecuador's Constitutional Approach to Space Law and the Protection of Nature

Diego Mauricio Álvarez Mejía

The 2008 Constitution of Ecuador stands as a global legal milestone by recognizing not only the right of individuals to live in a healthy environment, ecologically balanced, free of pollution and in harmony with nature (Art. 66.27), but also by granting rights of nature (Arts. 71–74). These principles have positioned Ecuador as a reference point in ecological constitutionalism and opened new avenues for reflection on the relationship between humanity, the environment, and technological development. In the context of the expansion of space activities—particularly the exploitation of natural resources on the Moon, asteroids or Mars, and the proliferation of satellites in Earth's orbit—important questions arise regarding how these principles can be translated into a framework of space environmental law. The 1967 Outer Space Treaty, while declaring outer space as the common heritage of humankind, lacks explicit provisions regarding ecological protection beyond Earth, or the human right to inhabit a contamination-free space environment. Given this, I propose a discussion on a conceptual and normative bridge between Ecuadorian ecological constitutionalism and the international regime of outer space law, developed in two key areas of analysis:

- The right to a healthy environment as a universal human right in space: projecting Art. 66.27 as an applicable principle for future extraterrestrial settlements.
- Rights of nature and extraterrestrial ecosystems: examining the potential application of Arts. 71–74 to outer space, considering the prevention of space pollution, resource exploitation, and the preservation of celestial bodies.

The presentation states that, in a scenario of increasing privatization and commercialization of outer space, Ecuador's constitutional principles can provide an innovative framework for rethinking space regulation from an ecological and human rights perspective. It thus proposes an approach that not only safeguards humanity's interests in the present but also recognizes the need to preserve the cosmos as a common good in harmony with nature.

Bio: Diego Mauricio Álvarez Mejía is an Ecuadorian lawyer with over 10 years of experience in digital law, technology regulation, and data protection. He currently serves as Country Manager of Niubox Legal | Digital in Ecuador, Vice President of the Ecuadorian Space Society, and Director of the Ecuadorian Chamber of Innovation and Technology (CITEC). He holds a Law degree from the Pontificia Universidad Católica del Ecuador (PUCE) and a Master's degree in Telecommunications Law, Data Protection, Audiovisual Law, and Information Society from Universidad Carlos III de Madrid. He is also certified in Artificial Intelligence and Space Law by the University of Amsterdam's Institute of Law and Technology. He has advised global technology companies on digital regulation, privacy, and public policy issues in Ecuador. He is a university professor in digital law, legal innovation, and data protection, and an international speaker on law and technology.

Orbital Congestion Through the Alternative Lens of Environmental and Criminal Jurisprudence in Outer Space

Nirbindu Banerjee

In recent years, the exponential escalation in satellite launches has resulted from creating mega-constellations from private actors, like Starlink or Project Kuiper, and state-run constellations like China's Guowang. International scholars have argued that this forward pattern has already precipitated a crisis of orbital congestion. The discussion has also revolved around how this accumulation of anthropogenic activities and interference harms astronomical studies and other environmental harms, which have raised questions about the indirect erosion of fundamental human rights of all. This paper contends that not only is orbital overcrowding a regulatory and policy-oriented issue, but it could also be an international environmental crisis involving international criminal law and the enforcement of human rights beyond Earth. The foundational principles of global space governance have rested on the laurels of the Outer Space Treaty for several decades. The tenets of non-appropriation, freedom of use and jurisdiction over registered objects are enshrined in Articles II, I and VIII, respectively. UNCOPUOS Guidelines for the Long-Term Sustainability of Outer Space Activities have remained soft law even after the rigorous process of finding suitable guidelines and practical implementation through many discussions in recent UNCOPUOS sessions. These provisions, while visionary, are often ill-equipped and burdened with international diplomatic currents to deal with the existing and ever-growing complex issues of environmental degradation caused by satellite mega-constellations and the cascading risk of collisions. The absence of universality and parallel fragmentation of responsibility has caused a vacuum where ecologically injurious acts can occur with near-impunity. This paper aims to inquire about the possibility of reclassifying such conduct that has a knowing disregard of orbital sustainability, or can be seen as gross actions derived from negligence. Drawing from the Rome Statute's jurisprudence, proposals to criminalise ecocide, and interpretive tools like General Comment No. 36 by UNHRC on the right to life, the analysis examines whether the destruction or irreversible pollution of orbital space could be considered a crime against humanity or future generations. While this article attempts to analyse the limitations of existing space treaties, auxiliary policy documents, and implementations, it also explores the right to dark and unpolluted skies, which can be critical for scientific freedom, cultural continuity, and equitable access to space. Jurisprudential arguments used to condense the positioning of this article are that the legal protection of the heavenly commons must transcend anthropocentric frames, according to theoretical insights derived from post-humanist and eco-centric studies, especially Donna Haraway's concept of interspecies kinship and Bruno Latour's philosophy. This doctrinal paper, in its strides, aims to argue that the orbital congestions are more than mere technical risks and might even extend into the area of normative wrongs whose consequences reverberate across borders. The working structure of the paper is tentatively divided into sections that discuss orbital congestion and human rights implications, followed by discussions of legal lacunae and jurisdictional challenges in addressing space-based ecological offences. Thereon, the penultimate and concluding sections discuss post-humanist legal theory to weigh the possibility of a new model of responsibility.

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The Inner Alien in our Outer Space: The Organisation of Space Settlements

Mukesh Chiman Bhatt

Migrating into space is seen as a solution to many of Earth's anthropogenic problems: and any such migrants will always carry their cultural baggage across terrestrial borders. Such trans-cultural values organise social interactions and political economies of settling in a new space, carrying forward and introducing new rights and obligation, integrating novelty into existing frames. Given the multiple origins of values as embedded in international law treaties of human rights, these rights will need to evolve in response to the hostile environment of outer space, contradicting the presumption that human rights are universal or eternal. In space, the evolution of these rights will need to reflect the multiple cultures and values of the groups left behind on Earth as well as those emigrants from different geographies and histories. Predicating such evolution of rights suggests an inverted symmetry, a change of status in the renewal of an autopoietic social organism, a mirror of the microcosm in the macrocosm. The necessity of survival technologies possibly aided by creative AI for such future settlements also adds a non-human element to this adoption and evolution of rights derived from life in Earth's biosphere - the Technosphere. Human responses to such change may be examined through the lens of science fiction and different cultural realities: the paranoia of HAL 9000, the ambiguity of the Terminator, Dan Stevens' loving android, Foner's omniscient and kindly EarthCent librarians, the daemonic Ra-One, anarchic Monkey travelling into the West and Darth Sidious' manipulative AI girlfriend amongst others. (247)

Bio: Mukesh Chiman BHATT is completing his doctoral thesis entitled Evolving Law beyond Earth on the implementation of law in space settlements at the School of Law, Birkbeck College, University of London, UK. A trans-disciplinary polymath and accredited Chartered Physicist, with core qualifications and competences in physics, languages, law, computing and translation technologies and the social sciences and over 80 peer-reviewed publications, cross-disciplinary public lectures, presentations and reports, his current interests include physics and science in general, science fiction, outer space, technology and society, culture and migration, world philosophies, and exercise, dance and movement all informed by multiple but enabling disabilities. He is a Kenyan of Gujarati Brahmin descent, a member of the UK Institute of Physics and an associate member of the UK National Union of Journalists and can be found on LinkedIn, researchgate and academia.edu. (135)

Protection of Human Rights in Space: Legal and Geopolitical Considerations

Prof. (Dr.) Sandeepa Bhat B

The astronauts are provided with an elevated status of being representatives of the entire mankind under the Outer Space Treaty 1967. The principle of "envoys of mankind" reflects this, especially with the understanding that the astronauts conduct their activities for the benefit and interests of all. By virtue of this elevated status, the astronauts are entitled to emergency assistance in case of any safety or security threat in space. This is a basic human right carried by every astronaut entering the domain of outer space by virtue of Article V of the Outer Space Treaty, which is also considered to be a part of customary international law. The Rescue Agreement 1968 extends this obligation of emergency assistance with respect to space personnel. Interestingly, its preamble mentions "*Prompted* by sentiments of humanity", indicating a possible broader application of obligations. Unfortunately, the substantive part of the Rescue Agreement does not reflect such a wider interpretation. With the commercialisation and increased human presence in space, complexities have arisen in the practical implementation of the obligation to render emergency assistance. While the Outer Space Treaty and the Rescue Agreement are not tailor-made to govern the commercial human presence in space, the geopolitical considerations are also adding fuel to the problems in the practical implementation of emergency assistance norms. Accordingly, this paper intends to cover the concerns in two parts. The first part debates the application of emergency assistance provisions with respect to the rescue of space tourists and other commercial space participants. The second part delves into the influence of complex geopolitical equations in rendering emergency assistance in outer space, highlighting the example of Sunita Williams and Butch Wilmore's wait for assistance in outer space.

Bio: Prof. (Dr.) Sandeepa Bhat is working as a Professor of Law and the Director of the Centre for Aviation and Space Laws at the National University of Juridical Sciences, Kolkata. He has the teaching and research experience of twenty-two years after completing his master degree with first rank and double gold medals in 2003. His seven Major Research Projects are sponsored by the World Bank, ISRO, the WB Judicial Academy, the Ministry of Justice, the Ministry of Environment, Forest and Climate Change, the Ministry of Commerce, and the Government of West Bengal. He holds the unique feat of being the first Indian to be inducted as the UNIDROIT Correspondent for India. He has been a member of four distinguished international bodies including the American Society of International Law. Dr. Bhat has published seven books on space law, four books on medical law and two more on aviation law. In addition, he has published more than seventy articles in the journals of international and national repute. He is the recipient of the inaugural Sachdeva Award for Space Law 2022 in recognition of his outstanding contribution to space law. He has presented over two hundred research papers in international and national conferences including the coveted International Astronautical Congress, as well as in international conferences held at Austin, Cambridge, Changsha, Charles Town, Istanbul, Jakarta, Paris, Seoul, Sharjah, Singapore and Southampton. He also has the distinction of being a member of the Indian Space Research Organization's Expert Committee for drafting the National Space Act for India.

International Humanitarian Law in Space-Enabled Conflicts: Dual-Use Infrastructures and Human Rights Implications

Dr Ioana Bratu

Modern armed conflicts on Earth rely on the use of space-enabled infrastructures. For instance, satellite communications, global navigation and positioning systems, and earth-observation satellites provide critical support for military command, targeting, intelligence, and logistics. At the same time, these systems are indispensable to civilian societies, making them inherently dual use. Their disruption or destruction in the course of hostilities can generate cascading effects, from interference with emergency response and transportation to the interruption of humanitarian relief operations and public communications.

International humanitarian law (IHL) offers the legal framework for limiting the impact of such operations during conflicts. However, its interpretation and application to dual-use infrastructures and terrestrial armed conflicts involving space-enabled technologies remain unclear. Specifically, how principles of humanity, distinction, proportionality, and military necessity should be applied in such complex scenarios demands further examination. Therefore, the aim of this presentation is to critically assess such interpretive uncertainties and to explore the legal implications for both the conduct of hostilities and the protection of fundamental human rights.

Bio: Ioana Bratu is an Assistant Professor in Space Law at Vrije Universiteit Amsterdam. She has introduced space law as a new area of law part of the educational curricula offered by the Law Faculty, and she acts as the lead of all academic activities involving space law and space policy at VU Amsterdam. She is the Co-Director of Amsterdam Law & Technology Institute, the Coordinator of the Space Law & Sustainability Center, and the Founder of AI ∞ Space Law Society.

Remote Sensing and Humanitarian Relief During Disasters: Minding the Legal Gaps in the Age of AI

Dr Anna Marie Brennan

This paper explores the evolving intersection of disaster relief, remote sensing law, and human rights within the broader framework of outer space law. As climate-induced and natural disasters intensify globally, the deployment of space-based technologies—particularly remote sensing satellites—has become indispensable for timely and effective humanitarian response. Yet, the legal architecture governing these technologies remains fragmented and underdeveloped, especially in relation to the obligations of commercial operators and the protection of human rights. This paper argues for the establishment of a comprehensive international regulatory framework to coordinate the use of space technology in disaster management. Such a framework must address not only the technical and logistical aspects of data collection and dissemination but also the ethical and legal responsibilities of remote sensing actors. Central to this inquiry is the question of whether commercial satellite operators bear a duty to provide critical data to states and non-governmental organizations during crises, and how this duty intersects with the human rights of individuals and communities being observed from space.

Remote sensing activities, while often framed as neutral or benevolent, can inadvertently infringe upon privacy, autonomy, and dignity—core human rights enshrined in international law. The lack of explicit safeguards for remotely sensed populations raises concerns about consent, data ownership, and the potential misuse of imagery. These issues are further complicated by the rapid integration of artificial intelligence into remote sensing systems. AI-driven analytics can enhance disaster prediction and response, but they also introduce opaque decision-making processes and algorithmic biases that may exacerbate existing vulnerabilities or lead to discriminatory outcomes. By situating remote sensing within the legal domain of outer space governance and human rights law, this paper highlights the urgent need for normative clarity and institutional accountability. It calls for a rights-based approach to space technology regulation—one that ensures transparency, equity, and ethical stewardship in the use of satellite data for humanitarian purposes. Ultimately, the paper contends that safeguarding human rights in the age of AI-enhanced remote sensing is not merely a technical challenge but a moral imperative that must be addressed through robust international cooperation and legal innovation.

Bio: Dr Anna Marie Brennan is a Senior Lecturer (Above the Bar) in Law at the University of Waikato, New Zealand. In 2024, she was awarded the prestigious Borrin Foundation Women Leaders in Law Fellowship. In 2024, Dr Brennan was appointed to the Working Group on the Future of the Moon Agreement at the International Institute for Space Law. She currently serves as the New Zealand Chair of the AI and Space Law Society, which advocates for the responsible and sustainable development of space in the age of artificial intelligence, emphasizing its role in addressing global challenges. She is also a member of the Committee of the International Peace and Security Interest Group at the Australian and New Zealand Society of International Law.

Envoys or Combatants? Rethinking Astronaut Status in Times of Conflict

Raoul Cardellini Leipertz

In the current era, when hostilities may extend into outer space, the legal status of astronauts remains a contentious issue at the intersection of space law, international humanitarian law (IHL), and international human rights law (IHRL). The Outer Space Treaty (OST) of 1967 bestows upon astronauts the grandiose, yet legally empty, title of "envoys of mankind" and, together with the Rescue Agreement, establishes duties of rescue and return. These provisions were conceived for peaceful exploration and do not anticipate scenarios in which astronauts are implicated in hostilities or deployed on missions with military significance. By contrast, IHL requires a functional assessment of participation in conflict: civilians retain protection "unless and for such time as they take a direct part in hostilities," as set out in Additional Protocol I to the Geneva Conventions. The growing role of commercial human spaceflight further complicates this picture, as private participants may lack the protections afforded to state-sponsored crews. Article III of the OST affirms that activities in outer space must be conducted "in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security." This provision serves as a normative bridge, ensuring that outer space is not insulated from the broader framework of international law. Read together with the jurisprudence of the International Court of Justice, which has confirmed the continuing applicability of IHRL in armed conflict, Article III supports the view that astronauts' fundamental rights, as articulated in the International Covenant on Civil and Political Rights (ICCPR) and the International Covenant on Economic, Social and Cultural Rights (ICESCR), cannot be displaced in wartime operations. On this basis, the paper proposes a threshold test to reconcile treaty protections with humanitarian obligations. Astronauts retain their protections unless they materially contribute to hostilities, for instance, by operating offensive payloads or providing targeting data. Once this threshold is crossed, they may be treated as combatants or direct participants under IHL. Even in such cases, however, astronauts who are captured, incapacitated or otherwise rendered incapable of combat must be recognised as hors de combat and protected from attack. This obligation resonates with the Rescue Agreement, which reinforces duties of assistance and complements IHL protections. Moreover, as private corporations increasingly place astronauts and space tourists in orbit, questions of corporate responsibility and human rights due diligence become inescapable, particularly where missions risk exposure to conflict.

Bio: Raoul (They/Them) is a prospective* doctoral researcher at the Centre for Higher Defence Studies in Rome, specialising in the intersection of space law and international humanitarian law. They hold a Master's degree in Law and a second in European Studies from the University of Perugia, a Master's in Space Institutions and Policies from SIOI, an Advanced LL.M. in Air and Space Law from Leiden University, and a Master's in International Relations from LUMSA. Their studies were supported by merit-based scholarships from the Italian Space Agency, Leiden University and the Rome Foundation. Raoul has undertaken visiting research at Freie Universität Berlin, KU Leuven and the International Institute of Air and Space Law in Leiden. They have presented at over fifteen international conferences in the field of space law and gained practical experience in the space sector, including at the Space Security Office of the Royal Netherlands Air Force.

Red vs Green Mars: Use as the Province of All Mankind versus the Rights of Martian Nature

Dr Thomas Cheney

In Kim Stanely Robinson's Mars trilogy, a central debate arises between the 'Reds' who want to preserve Mars as they found it, and the 'Greens' who want to develop Mars for its human settlers. This debate could become a real issue in the coming decades, exacerbated by tensions within space law and international law. The Outer Space Treaty is ostensibly a pro-use treaty. This is clear from the preamble and Article I. Indeed, there cannot be 'benefits' from the 'use' of outer space without use to generate those benefits. Nor does the declaration of use as being the 'province of all mankind' have much meaning without any use. Furthermore, international legal developments take a generally pro-development approach. Indeed, UN General Assembly resolution 41/128 declares a 'right to development.' Space expansionists posit their cause as necessary for the future of human flourishing, and this does seem to, at least on the face of it, fall into the logics of 'sustainable development'.

The explicit environmental provisions of the Outer Space Treaty are at best minimal. Article IX declares that states should conduct their activities so as to avoid the harmful contamination of celestial bodies. This does have potential to be quite wide ranging particularly if we draw upon COSPAR planetary protection policy and the related discussions around the time the Outer Space Treaty was under development. And the ever-increasing evidence that there is good reason to presume that Mars was at least at one point inhabited argues for a strict adherence to planetary protection guidelines. Which raises another aspect of Article I OST which is the freedom of scientific investigation. The search for extraterrestrial life has to be one of the foremost questions in the scientific investigation of outer space. More recent developments in the concept of the rights of nature also raise questions under Article III – namely do the rights of nature apply in outer space and if so how dependent upon the existence of a biosphere are those rights? This could be an important testing ground for Article VI of the Outer Space Treaty, how do states balance the rights of individuals and corporations to use and develop outer space against their obligations to protect the space environment and any potential extraterrestrial life? This paper will explore this through the lens of Robinson's Mars books, space and international law.

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Justice in Space: quo vadis, Conflict of Laws?

Dr Stefano Dominelli

Access to justice also presupposes the possibility for natural and legal persons to have a court deciding claims if their rights are infringed. In cross-border cases, this calls for the determination of the applicable law. However, adopting a European and continental perspective determined by the legal system of origin of the author, the Rome II Regulation operates under the basic assumption that a tort/delict giving rise to liability can be localized in a 'country'. This has not always necessarily been true, and future evolutions may stress even more that damages can arise in areas that are not subject to the sovereignty of a State. The presentation has two manifold aims. First, it seeks to contribute to the emerging legal debate on the (in)adequacy of traditional connecting factors in respect to events that take place in outer space. Focusing on satellite accidents, and comparing solutions with collisions at sea between ships, the presentation will analyze gaps and possible solutions to identify the proper law governing tort for private claims against the background of relevant space law treaties. Second, the presentation will dwell on possible future evolutions of space activities, namely space tourism and human settlements in space. Assuming the inadequacy of the current legal framework, a look in current approaches to extreme tourism on the deep seabed, and approaches followed in respect to the International Space Station, will constitute a starting point to debate about which roads should be taken to reconcile extra-terrestrial events with territorial application of laws.

Bio: Stefano Dominelli is Associate Professor in Public and Private International Law at the University of Genoa; his main research interests are comparative conflict of laws in contract and torts, and new frontiers in private international law related to nature rights and technological evolutions.

Beyond Targetability: Liability and Human Rights in the Militarisation of Space

Alexandros E. Farsaris

The expansion of human activities in outer space is more topical than ever. Initiatives such as space tourism, resource exploitation, and even plans for permanent settlements are becoming a reality. At the same time, outer space is simultaneously being militarised. The ongoing war in Ukraine has already demonstrated the strategic advantages of space systems in modern warfare. While the legality of targeting such systems under international humanitarian law has been widely debated, the aftermath of potential attacks remains largely unaddressed. Current international and space law liability regimes do not provide effective solutions to these challenges. In an era of expanding human presence and reliance on outer space, this paper argues that the liability regime is due for an update, particularly in light of the growing militarisation of the domain. As noted, neither the existing international regime nor the academic initiatives provide answers for damage caused by military operations in space. The Russo-Ukrainian war illustrates the risks, and while Russia has mainly relied on jamming and cyber-attacks, it has also warned that commercial satellites supporting Ukraine can constitute legitimate targets for retaliation. A kinetic strike would generate vast debris, threatening satellites and the right to development for states relying on them, endangering ISS personnel and their right to life and security, and undermining equal access to outer space. A strengthened liability regime is key not only to deter such attacks, but also to provide accountability and stability for the development of the space sector. Yet current rules leave unresolved questions: which actor bears liability, the launching state of an anti-satellite missile, the aggressor using satellites for military gain, or the provider enabling that use? More broadly, is fault-based liability viable for the future of space activities, and can it function as the legal bridge ensuring that human rights are not left without remedy when harm occurs in outer space?

This paper examines existing international and space law provisions, identifying the current shortcomings. The analysis further reviews the human rights at stake and the importance of ensuring prompt and secure compensation. Moreover, it explores preliminary solutions through comparative analysis with other liability regimes, such as strict liability in outer space for military attacks and the creation of a burden-sharing framework. Ultimately, strengthening liability is essential not only for deterrence and accountability, but also for safeguarding human rights and future activities in space, ensuring no rights are left without remedy.

Bio: A.E. Farsaris is an independent researcher and lawyer with an LL.M. in Space, Communication, and Media Law from the University of Luxembourg, where he graduated with a thesis on the customary status of liability provisions in space law. He also holds a five-year integrated law degree from the University of Macerata, Italy, with a thesis on legal aspects of the International Space Station. He has published on topics such as lunar heritage protection, cyber and outer space governance, and prospective Mars agreements. He has represented his universities in multiple international moot court competitions, including the Manfred Lachs Space Law Moot Court. Beyond academia, he has professional experience in corporate governance and compliance with Revantage (a Blackstone company) and CSC, and is currently serving his mandatory military service with the General Directorate of National Defence Policy and International Relations in the Hellenic Ministry of Defence.

Gene Technology and Plant Growth in Outer Space for Astronaut Nutrition – To What Extent Must Cultural Acceptability be Considered to Fulfil the Adequacy Criteria of the Right to Food?

Dr Ciara Finnegan

The new era of human exploration of Outer Space, highlighted by the Artemis program's aim to return humans to the lunar surface and sustain human space exploration, offers the opportunity for innovation, including in the nutrition of astronauts. Mortimer and Gilliham outline that the growth of plants in Space offers "enormous potential for the production of nutritious food" for astronauts. To best facilitate and optimise plant growth for food production in Space, technological capabilities can be used, including that of gene technology. Gene technology is defined in the Gene Technology Act 2000 as "any technique for the modification of genes or other genetic material" with certain exclusions. However, the potential benefits that gene technology offers for plant growth in Space must be balanced with considerations of international human rights law, which applies to Outer Space activities as per Article III of the Outer Space Treaty 1967. One particular consideration is that of the right to food. Enshrined in Art 11 of the International Covenant on Economic, Social and Cultural Rights (ICESCR), the right to food extends further than the "fundamental right of everyone to be free from hunger", with it recognised that the right to an adequate standard of living is inclusive of "adequate" food. The Committee on Economic, Social and Cultural Rights' General Comment 12 outlines that "the core content of the right to adequate food implies…acceptab[ility] within a given culture". This element of adequacy requires understanding of "non nutrient-based values attached to food and food consumption" and in order to fulfil the right to food of astronauts in providing plants grown in Space, the potential implication of gene technology on this food for different cultures must be considered. An example would be considering whether plants grown with the assistance of gene technology would qualify as *halal* food under Islamic law and thus, whether the right to food was being adequately fulfilled for astronauts of the Islamic faith. This paper will investigate the extent to which the question of what qualifies as "acceptable within a given culture" must be considered to ensure that plant growth in Space, in particular with the assistance of gene technology, meets the adequacy standard of the right to food.

Bio: Dr Ciara Finnegan is an ARC grant-funded researcher in Law and Ethics in the ARC Centre of Excellence in Plants for Space in Adelaide University. She was awarded her PhD entitled 'How the Principle of Humanity in International Humanitarian Law can inform Weapons Regulation in Outer Space' in March 2024 from Maynooth University in Co. Kildare, Ireland and worked as a Lecturer in Law in Northumbria University in Newcastle-upon-Tyne, England from October 2023 until January 2025.

The Human Right to a Future: Biotechnology and Species Survival in Space Law

Chelsea Franck

Human rights frameworks were designed to safeguard dignity, freedom, and equality within terrestrial boundaries. However, as humanity prepares for settlement beyond Earth, we face existential questions that existing law is ill-equipped to answer. This paper argues that what should seemingly be the most fundamental human right, the right to human continuity, must be recognised within the governance of outer space. Addressing this question requires confronting the technologies that will make survival possible. Central to this challenge is biotechnology: the very adaptations that may enable survival in extraterrestrial environments also introduce unprecedented risks, requiring careful legal and ethical regulation. Emerging biotechnologies such as genetic modification and synthetic biology may allow humans to withstand the high-risk environment of outer space. However, without legal and ethical oversight, these same technologies pose profound risks: exploitation by private actors, inequitable access to survival tools, and the erosion of human identity and dignity. While foundational space law affirms that the 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", it offers no provision, remedies, or enforcement mechanisms for safeguarding humanity's collective future. Similarly, human rights law focuses on individual rights in the present, leaving unaddressed the species-level risks of extinction or irreversible transformation.

This paper addresses three claims. First, outer space law must be expanded to recognise a collective 'human right to continuity', drawing upon analogies from intergenerational justice, climate change law, and Indigenous legal traditions that emphasise responsibilities to future generations. Second, biotechnologies should be regulated under a framework that treats them as a survival-enabling necessity rather than proprietary tools, ensuring equitable access and preventing the monopolisation of control and ownership. Third, governance must be anticipatory, embedding existential risk considerations into law so that survival strategies do not themselves become threats to human rights. By reframing the discussion from individual protections to species preservation, this paper proposes a novel integration of human rights and space law that confronts the dual realities of outer space, both as a domain of unprecedented opportunity for survival and as a site of profound ethical peril.

Bio: Chelsea Raine Francek is a lawyer and PhD in Law candidate at the University of Waikato, specialising in outer space law and biotechnology regulation. Her doctoral research examines the role of biotechnology in human survival beyond Earth, with a focus on developing equitable and anticipatory legal frameworks that address existential risk. Prior to entering academia, she held senior positions across legal, regulatory, and policy roles, as well as executive leadership in the non-profit sector. Her professional background spans security, governance, development, and international regulatory compliance, informing her interdisciplinary approach to space law. She holds a Bachelor of Arts in International Studies, a Juris Doctor in International and Comparative Law, and a Master of Laws in Outer Space Law. Chelsea's broader research interests include existential risk governance, dual-use technologies, and the preservation of humanity as a legal and ethical imperative.

Human Rights in Space Settlements - An Analysis of the Application of Relevant Customary International Law and of National Laws

Francesca Giannoni-Crystal

This paper explores two underexamined dimensions of the application of human rights in outer space. First, while outer space treaties remain silent on this issue, foundational norms of customary international law might apply. Historical analogies support the application of such norms in space. A further instructive analogy is Antarctica. Drawing on examples such as the "Sputnik moment" (when space activity predated specific treaties but was nonetheless governed by general international law) as well as provisions of the Outer Space Treaty (such as the freedom of exploration and use under Article I, the application of international law under Article III, the rescue obligations of Article V, and the obligation of due regard and the prohibition of harmful interference under Article IX), this paper argues that human rights protection derived from customary international law does, in fact, extend to future space settlements. Second, the paper explores how national laws may extend individual rights beyond Earth. Drawing upon the common law maxim "The Englishman carries his law with him" (which historically supported the extraterritorial application of domestic law to frontier environments) and analogous doctrines in civil law traditions (where jurisdiction and personal status law "follow" individuals), the paper analyzes whether domestic legal protections should apply in space settlements. This would be significant, as constitutional rights (such as those found in the U.S. Constitution's Bill of Rights and in the constitutions of other countries) would form part of the legal framework of space settlements. In addition, statutory rights (such as those in the U.S. Civil Rights Act of 1964 and the Americans with Disabilities Act, as well as similar statutes in other countries) which give domestic legal effect to internationally recognized principles of human rights, could also apply in space. Together, these international and domestic legal sources would establish a situation in which both public and private actors are bound to respect human rights in space, even in the absence of a detailed space-specific treaty regime, however the exact scope could be different because of the extreme settlings of space. However, enforcement mechanisms in the vacuum of space remain problematic. The absence of functioning legal institutions raises challenges for adjudication and compliance. Science fiction depictions -- such as the Belters in The Expanse series by James S. A. Corey -- offer a cautionary tale about the emergence of second-class citizens in the Solar System, a scenario that must be avoided at all costs.

Bio: A founding member of Crystal & Giannoni-Crystal, a boutique firm focused on ethics and international matters, Ms. Giannoni-Crystal also serves as outside in-house counsel for the Pasquali Group (aerospace and defense). Her practice includes transactional and compliance work for law firms and companies. A multilingual attorney, her background includes work with Deloitte Legal and as in-house counsel for a global internet group. She has authored over twenty scholarly articles on space law, professional responsibility, privacy, and technology, along with numerous shorter pieces on topics such as AI and the legal profession. Her recent work focuses on ISAM, lunar refueling, space agriculture and biotechnology, space defense, and satellite cybersecurity. Holding two law degrees from the University of Florence and Charleston School of Law (cum laude), and an LL.M. in Air and Space Law (summa cum laude) from the University of Mississippi, she is admitted to practice in NY, DC, and Italy.

Islamic Issues Involved in Space Travel: A Human Rights Lens

Hyder Gulam

The purpose of this research discussion paper is to understand the Islamic issues involved in Space Travel, which is a novel field. Hitherto, only limited research has been undertaken on how Muslim astronauts can maintain their Islam for a prolonged period away from the Earth. This paper will commence with an introduction to Islamic law (which includes the distinct term fiqh), before discussing the obligations of Muslims in space. Also discussed in this paper will be the Maqasid, or higher objectives, which provides an avenue for Muslim space travellers to maintain their Islam within the framework of the religion. The methodology used in this paper is based on research of existing literature, comments from previous Muslim astronauts as well as a review of Muslim law that pertains to travel. The finding of this paper sets out the application of Islamic Law for interstellar Space Travel and off-world colonisation. It discusses the relevant ibadah rulings (literally meaning religious rituals such as prayer, fasting, ablution, keeping halal, and death rites inter alia) and how these can be practically applied in the context of space travel. This paper also outlines the moral, legal and practical challenges faced by a Muslim undertaking Space Travel and discusses the relevant Islamic 'knowledge' that may assist in reconciling these issues. The term interstellar Space Travel and colonisation is used to refer to those activities that are performed away from the Earth, such as in the micro-gravity of space or on an off world colony i.e., Mars.

This paper is unique from other published papers in the field as it contemplates off world habitation and not just a short-term sojourn into space. The research finding is that Islamic Law is able to adapt to the challenges of space by incorporating how early Muslims maintained their Islam while traveling long distances outside their home countries. This is an emerging area of study, so there is a dearth and scarcity of literature about Muslims in space written from a scholarly perspective. This paper intends to rectify this situation by providing a marker for other scholars and researchers to follow.

Orbital AI Governance: Accountability Gaps and Human Control of Autonomous Space Systems

Jonathan Iwry

Artificial intelligence is increasingly being incorporated into space-related activities, from autonomous navigation, collision avoidance, and resource prospecting to intelligence, surveillance, reconnaissance, and prospective weapons systems. These applications promise efficiency and responsiveness in an environment where human intervention is often slow or impossible. Yet they also attenuate human agency and decision-making responsibility, raising acute challenges for accountability in a domain where the stakes are exceptionally high: the safety of astronauts, the sustainability of orbits, and the prevention of armed conflict in space. This article examines the intrinsic tradeoff between automation and accountability in the governance of space activities. As AI systems assume greater roles in navigation, risk assessment, and even targeting decisions, the very features that make AI indispensable—speed, adaptability, and independence—threaten to undermine responsible use of space-related technology and responsibility for harmful outcomes. AI is already central to autonomous collision avoidance maneuvers in mega-constellations such as Starlink, where decisions must be taken too quickly for human oversight, and programs such as DARPA's Blackjack, which uses AI to coordinate satellite constellations for intelligence, surveillance, and reconnaissance (ISR). One can imagine cases in which autonomous military systems in orbit misinterpret signals or act faster than political decision-makers can intervene. As systems autonomously decide when to maneuver or when to classify an object as a threat, the increasing reliance on remote and automated decision-making could attenuate the link between human decision making and the consequences of these technologies becomes weaker.

The dual-use nature of these technologies intensifies the problem: the same algorithms that enable peaceful exploration and debris avoidance can be militarized, often without clear lines of demarcation. Machine learning systems can support disaster relief by processing imagery from satellites to identify objects of interest, but that same technology supports remote military targeting and surveillance. Likewise, the U.S. Space Force, Russia, and China all pursue AI-enhanced "space situational awareness" (SSA) to track space objects and predict orbital trajectories—ostensibly for debris avoidance, but also to monitor adversaries. This blurring undermines trust among states and complicates cooperation in an already fragile governance environment. This article gives particular attention to the standards of control necessary to prevent accountability gaps. Under existing arms control law, the concept of "meaningful human control" has emerged as a central requirement for ensuring that human actors retain responsibility for the use of force. However, I argue that space activities call for a refined conception of control that applies not only to weapons but also to risk-creating uses of AI more broadly, including civilian or dual-use systems whose failure could produce cascading harms. Clarifying what it means for humans to exercise genuine oversight and control is essential both for accountability in individual cases and for maintaining the collective trust needed to sustain cooperation in space governance. Without stronger standards of control and responsibility, the integration of AI into space will exacerbate existing accountability deficits and heighten the risk of catastrophic outcomes. In the face of accelerating automation, legal and institutional frameworks must ensure that advances in space technology do not come at the cost of eroding the foundations of responsibility that support human rights, security, and the sustainable use of outer space depend.

Bio: Jonathan Iwry is a Fellow at the Accountable AI Lab at the Wharton School of the University of Pennsylvania. His work focuses on the philosophical challenges posed by emerging technologies for foundational legal concepts. Regarding space law, he has authored or co-authored publications on collective action problems in planetary defense and medical liability for commercial spaceflight. His work has been published in *Acta Astronautica*, the *Food and Drug Law Journal*, *Bloomberg Law*, *Psychological Methods*, and *Frontiers in Human Neuroscience*. He was previously a corporate associate at the law firm of Ropes & Gray LLP. He received his J.D. from Harvard Law School and B.A., *summa cum laude*, in Philosophy and History from the University of Pennsylvania. During law school, he served as a Teaching Fellow in two Harvard College courses—Prof. Michael Sandel's "Justice" course and Prof. Joshua Greene's course on AI ethics—and received awards from Harvard University for excellence in teaching. He moonlights as a freestyle rap artist, having performed at the Apollo Theater in Harlem, and is a twelve-time winner of the Supreme Bars rap tournament in Brooklyn.

Constellations of Duty: Conditioning Space Licenses on Human-Rights Due Diligence and the Right to Science

Edward Koellner

Private spaceflight is no longer a sideshow; it's the main act. Yet our licensing regimes still treat human rights and access to essential knowledge as optional extras. This paper sketches a practical fix: make launch and mission licenses contingent on two linked obligations—UNGP-style human-rights due diligence (HRDD) across the space value chain and a limited, enforceable "right to science" that keeps critical safety knowledge and life-support know-how within reach of all operators and crews. The argument proceeds in two moves. First, de lege lata, it reads Articles I, VI, and IX of the Outer Space Treaty alongside the right to benefit from science to show that states already have the room (and arguably the duty) to bake HRDD and knowledge-sharing into authorization and continuing supervision. Second, de lege ferenda, it offers a draft "Human Rights & Science Annex" that regulators can bolt onto national space laws and license templates without rewriting the whole system.

What would this look like on the ground (or in orbit)? Mandatory human-rights impact assessments before mission approval; clear limits on private security and use of force; auditable "mission data rooms" covering labor conditions, safety events, and environmental impacts; grievance and remedy pathways, including escrowed victim funds. On the science side: pre-competitive data pools for ephemeris, safety, health, and environmental information; FRAND/open-standard commitments for life-support and hazard-mitigation tech, with emergency compulsory-licensing triggers; and AI governance rules that guarantee explanation and contestation when algorithms affect life or health. To avoid chilling innovation, the Annex carves out trade secrets for non-safety technologies and sets staged disclosure timelines. The paper draws practical guardrails—KPIs, audit cycles, cross-recognition among licensing states, and proportionate sanctions (from corrective action plans to suspension). The upshot is a licensing model that makes human dignity and usable knowledge core infrastructure for off-world life, rather than afterthoughts—ambitious enough to matter, modest enough to implement.

Bio: Edward "Ed" Koellner, JD, MBA, MS, LLM, is a patent attorney and fintech strategist working at the intersection of intellectual property, space law, and AI. As Principal of Oort Ventures, he advises Web3, aerospace, and space-economy ventures on IP, licensing, and regulatory compliance. He has led legal and compliance work with USAA, Citibank, and SunTrust, and serves as Corporate Secretary on the Board of Directors of For All Moonkind. An Adjunct Professor at UNH Franklin Pierce School of Law, he teaches courses on Space Law, Intellectual Property, and AI. Ed's research focuses on IP governance for satellite, suborbital, and autonomous systems, with recent presentations at EPIP 2024 (Pisa), the International Conference on EU Space Governance (Brussels), SIRIUS Space Talks (Toulouse), and Heritage in War and Peace IV (Glasgow). He holds degrees from West Virginia University, Marquette, TCU, ASU, and the University of Mississippi (LL.M., Air & Space Law).

International and European Approaches to Human Rights Protection in the Space Sector: Prospects for the Future

Dr Zuzanna Kulińska-Kępa

As John Ruggie noted in 2020: “Building back better must not become a slogan for some technical fix. It should serve as a call for a fundamental rethink of how things are done, one which puts people at the center rather than treating them as a factor of production”1. In light of this appeal, it is essential to consider the emerging binding norms in business and human rights and its application to the space sector. In recent years, the international arena has witnessed growing legislative activity in the field of human rights due diligence. The European Union adopted the Directive (EU) 2024/1760 of the European Parliament and of the Council of 13 June 2024 on Corporate Sustainability Due Diligence (CSDDD), which entered into force on 25 July 20242 . At the global level, increasing attention is being devoted to the draft Legally Binding Instrument on Transnational Corporations and Other Business Enterprises with respect to Human Rights3 , an initiative under the auspices of the United Nations aimed at establishing binding international standards to ensure that businesses respect human rights and provide effective remedies for victims of corporate abuses. This research explores how existing international human rights frameworks, particularly the CSDDD and forthcoming UN Business and Human Rights Treaty and, can be applied to the space sector. It examines the sector’s complexity and the potential risks of human rights violations associated with commercial space activities. The aim of this research is to alert both policy-makers and actors in the space sector — including researchers and industry practitioners — to the specific human rights risks arising from space strategies and operations, and to stress that due diligence is not only critical but must be tailored to the unique context of the space domain. Moreover, this research seeks to promote the adoption and diffusion of due diligence practices across the sector as a central pillar of protection. In the words of Eleanor Roosevelt: “Where, after all, do universal human rights begin? In small places, close to home — so close and so small that they cannot be seen on any map of the world. Yet they are the world of the individual person … Unless these rights have meaning there, they have little meaning anywhere. Without concerted citizen action to uphold them close to home, we shall look in vain for progress in the larger world.”

Bio: Zuzanna Kulińska-Kępa – Ph.D., Assistant Professor in the Department of International Air and Space Law at the Faculty of Law and Administration of the University of Warsaw, founder of the Manfred Lachs Center for Space Law. She graduated from the University of Warsaw and the University of Poitiers and was a scholarship recipient of The Hague Academy of International Law (2016). Since 2017, she has been a member of the Polish delegation to the LSC COPOUS. Since 2019, she has been listed as an attorney at the Warsaw Bar Association. For over 20 years, she has held various managerial positions at Amnesty International. She is a member of the Supervisory Board of the Space Technology Park – Research, Development, and Innovation. She specializes in space law, international human rights law, humanitarian aid and international organizations. At the University of Warsaw, she teaches, among other subjects, sustainable development in outer space, space law and human rights

A Copernican Shift for Space Law: Redefining Outer Space for Self-Determination

Matthew Leathers

International bodies and legal instruments frequently position the right to self-determination as a foundational precondition for the full enjoyment and most effective guarantee of all other human rights. Article 1 of the International Covenant on Civil and Political Rights states that "All peoples have the right to self-determination. By virtue of that right, they freely determine their political status and freely pursue their economic, social and cultural development." Yet, Article II of the Outer Space Treaty (OST) proclaims "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty…by any means." Its framers' intention was to prevent conflict by prohibiting territorial disputes in space. But this presents a significant barrier, and ironically a source of conflict, for a future Martian people exercising their inherent right to self-determination: the non-appropriation principle prevents claims of sovereignty over territory, a core requirement for statehood under the Montevideo Convention. How could a Martian, gazing skyward, make sense of this arrangement? Earth is just another speck in the cosmic tapestry, no grander than Saturn or Jupiter. Nevertheless, the OST deems this blue planet unique: the only celestial body beyond its purview, where nations carve borders, claim dominion, and through Articles VI and VIII, tether her world to their jurisdiction and control. Why, she ponders, should that distant dot, a planet like hers, hold such sway over her red horizon?

Keen observers of space law have identified this conflict, but few recognise the more fundamental conceptual flaw behind it: our geocentric model of space law. It stems from our earthly perspective 'looking out' at space. Somewhat miraculously, the space law treaties left "outer space" undefined. Yet it is clear they made Earth the centre of the legal universe. Space law assumes Earth is "exospatial" – outside the definition of "outer space" – and thus uniquely exempt from its scope, forever positioning it as the sole source of sovereignty lording over the cosmos. To resolve this folly, we don't need to get rid of the non-appropriation principle; we simply need a better definition of outer space. The Celestial Subjectivity Model provides a coherent definition of outer space, resulting in the equality of celestial states. Any celestial state meeting the Montevideo requirements will also be exospatial, and thus outside the scope of the OST. This can preserve the peaceful intentions of the non-appropriation principle and the protection of human rights in space.

Bio: Matthew Leathers is a master's student at Victoria University of Wellington, researching reforms to international space law to address the space debris crisis threatening Earth's orbital sustainability. After earning his Bachelor of Laws and Bachelor of Arts in Philosophy in 2024, he received a scholarship to pursue a master's thesis on this critical issue. Matthew is the 2025 recipient of the Geoff Masel Prize from the Aviation Law Association of Australia and New Zealand for his winning essay critiquing the geocentric definition of "outer space" in space law, advocating for a shift in legal perspective to support human settlement and prevent conflict in space. Having transitioned from a career in hospitality, Matthew is driven by a lifelong passion for space and a deep interest in law, aspiring to contribute to the evolving field of space law.

A Human Rights-Based Approach to Food Sustainability in Outer Space

Jonathan Lim

The application of a human rights framework upon outer space affairs is relevant to addressing issues of food security and sustainability in support of long-term human activities in space and upon the lunar surface.The extraterritorial extension international human rights law (IHRL) values and principles into international space law (ISL) jurisprudence will hold states to account concerning their continuing obligations to respect, protect, and fulfill human rights under international law. This bears additional relevance upon the promotion of humanity's ability to meet the needs of the present without compromising the ability of future generations to meet their own needs. Human rights represent universal, inherent, and indivisible rights possessed by all individuals by virtue of their existence as human beings. While States bear responsibility for the health and well-being of their citizens, the growing role of commercial space activities invites debate upon how the outer space activities of public and private actors alike can be regulated via the extraterritorial extension of international public law. This has been established under core ISL instruments (1967 Outer Space Treaty), and illustrated across IHRL customary law by uniform and consistent state practice.The application of a harms-based approach to human spaceflight activities underscores how outer space presents an inhospitable and hostile environment to sustaining human life, health, security, and dignity. This underscores the essentiality of a sustainable food system in providing astronauts and human spaceflight participants with ample sustenance to support human exploration both in low-earth orbit and upon the lunar surface. Conversely, the development of food safety systems by NASA contributed to the formation of global standards for hazard prevention under the HACCP system – highlighting how space applications can result in a tangible contribution upon terrestrial food security.

Cognizant of established criteria for space food systems by NASA and leading space agencies, state actors in space must work to clarify a universal and human-rights based framework premised upon key aspects of the human right to food, including: a) availability – ensuring the east-of-production or procurement of food in the outer space environment; b) accessibility – ensuring the continuing affordability of food for human spaceflight participants; c) adequacy – providing food which satisfies the dietary needs of differing groups and is safe for human consumption; and d) sustainability – requiring interoperable and resilient food systems which account for the needs of present and future generations.

Bio: Jonathan is an Australia lawyer, cybersecurity analyst, and public policy advisor with extensive experience across government, academia, and the private sector. His work bridges law, technology, and governance; focusing on developing secure and ethical frameworks for emerging technologies that advance national security and international cooperation. Jonathan's expertise in space law centres on the intersection of outer space governance and human rights. He is the founder of Jus Ad Astra, a global initiative advancing legal and ethical dialogue on space, and is an individual member of the International Institute of Space Law. He has presented on AI ethics and human rights in space activities at the International Astronautical Congress. He holds a Juris Doctor (Monash), a Master of Legal Practice ANU), and a Master of Cyber Security (Charles Sturt University); complemented by further postgraduate studies in international law, human rights, and technology regulation.

Interplanetary Law and the Right to Self-Determination

AJ Link

It is imperative to create room in the fields of space law, space exploration, and space governance to have serious and difficult conversations about how we decide to become an interplanetary species, or if we should even do so at all. This paper looks to explore how a future system of space laws and governance will operate between multiple celestial bodies, or at least the ways it should not operate. The term for this broader framework is Interplanetary Law. The application of human rights in Outer Space should not simply be an extension of the current International Human Rights Law regime, but also as an evolution into Interplanetary Human Rights Law that addresses some of the unique concerns that humanity will face if it attempts to populate multiple celestial bodies. Through the examination of multiple rights, including the Right to Self-Determination, it will become clear that the current space law framework will need to be reimagined, or a completely new framework will need to be developed, i.e., Interplanetary Law. Interplanetary Law should look to current models of polycentric governance and supernational regionalism as a guide for a potential federalist perspective of interplanetary governance.

A regional or federalist approach to interplanetary governance will require some form of territorial boundaries. Whether this kind of boundary setting conflicts with the non-appropriation principle of Article 2 of the Outer Space Treaty is not necessarily important for this exercise but will still be discussed. The more important question in the context of Interplanetary Law is the long-standing issue of the delimitation of air space and Outer Space. Once delimitation is addressed, the impacts on space traffic management and jurisdiction will be considered. The question of jurisdiction will be applied to current celestial bodies like the Moon and Mars, future sovereigns and/or independent states, as well as interplanetary (or inter-celestial body) space. The product of this analysis will lead to questions of the applicability of the current international treaty regime, and international law in its entirety, to new potential sovereigns on other celestial bodies.

Bio: AJ Link earned his JD from The George Washington University Law School and his LL.M in Space Law at the University of Mississippi School of Law. He was the inaugural director of The Center for Air and Space Law Task Force on Inclusion, Diversity, and Equity in Aerospace and is an adjunct professor of space law at Howard University School of Law. AJ serves as a research director for the Jus Ad Astra project and the Space Law and Policy Chair for Black in Astro. AJ is the human rights and policy lead for the Palestine Space Institute, which he helped cofound. AJ was previously a fellow at For All Moonkind's Ethics Institute and served as the Accessibility Team Lead for AstroAccess. He sits on the JustSpace Alliance board of directors where he previously served as chairperson and vice chair of the board. AJ is the first ever winner of the Above Space Diversity, Equity, and Inclusion Award.

CSR as a Mechanism of Protecting Human Life in the Ultrahazardous Space Environment

Dr. Maria Manoli, School of Law, University of Aberdeen

The concept of Corporate Social Responsibility (CSR) is linked to the responsibility of corporations to internally regulate their activities towards a positive impact on the company itself, but also on areas of global public interest, such as the environment and the global terrestrial ecosystem. This concept is particularly important in the context of corporations that engage in activities potentially harmful to the environment, the Earth's ecosystem (e.g. mining corporations), and human life itself. A large number of CSR policies and rules are internal to the corporations and not imposed in a binding manner by external actors, such as the State. In the field of space activities, the CSR concept has been used mainly in the context of space debris, sustainability and, more recently, capacity building. This paper examines the binding effect of CSR rules and policies adopted by space companies in the context of future extra-terrestrial settlements and asks whether the extraterrestrial protection of human rights should be made an essential component to such rules. To do so, the paper studies the international State responsibility mechanism for space activities as embedded in Article VI of the Outer Space Treaty, which renders States internationally responsible for ensuring that the activities of their private space companies respect international law. Within this context, the paper explores whether States have the international law obligation to supervise the CSR rules, policies, and mechanisms of private space companies with extraterrestrial settlement objectives, to ensure that they respect the standards of human rights law considering the dangers to human safety and life that are inherent to the extraterrestrial environment.

Bio: Dr. Maria Manoli is a Lecturer at the School of Law of the University of Aberdeen. She is also an associated researcher for the Chaire en gouvernance et droit du commerce international at the University of Montreal and an associated researcher for the Max Planck Institute for Comparative Public Law and International Law in the context of the project MAGGI (the Multiplication of Authority in Global Governance Institutions). She holds a PhD (DCL) from the Faculty of Law of McGill University, where she was also the Executive Director in 2022. Her research interests focus on Space Law, Public International Law, Legal Theory, and Critical Legal Studies.

Working Across the Stars: Private International Law Aspects

Dr Filippo Marchetti

Historically, outer-space exploration has been conducted by States through military personnel and, only relatively recently, though civilian contractors. This led to the development of a corpus iuris spatialis that is firmly grounded in public international law. For the last decade, however, private companies have aimed to develop purely-commercial space activities, ranging from the well-known suborbital flights to the more conceptual space hotels, space colonies, and asteroid mining. The response to this trend has largely been the development of national space law to bridge the gap between this emerging industry and the treaty-based regime. This blend of public international and national law will come under pressure as the private industry matures. In this environment, the fulfilment of certain human rights rests on the effectiveness of redress mechanisms. As such, it becomes essential to understand if and how private international law (PIL) can be an instrument in future private-to-private space disputes. The paper will focus on jurisdiction and applicable law in relation to individual employment contracts, as litigation is one of the avenues to enforce worker rights. The focus will be the European Union (EU) PIL regime, and the key question is: is PIL put under pressure by the nature of space activities, in particular the establishment of orbital structures, colonies, and mining activities?

With regard to jurisdiction, the paper will explore the functioning of the dedicated rules for employment contracts (Arts 20-23 of Regulation EU 1215/2012 Brussels Ia), assessing the combination of rules based on elements connected to the parties (e.g., defendant's domicile), with rules based contractual or factual elements (e.g., place of work execution). The first type of rules appears to hold well in a space-based scenario. For example, the defendant's domicile rule remains easily applicable. However, the second type of rules would come under pressure, because the non-appropriation principle, limits the establishment of jurisdiction on celestial bodies (space objects are less problematic). With regard to applicable law, the focus will be on Art 8 of Regulation (EC) 593/2008 Rome I and the assessment will highlight a general alignment of the applicable law provisions with the rules on jurisdiction, with special attention on imperative rules of the forum, including those protecting the right of workers. Finally, the paper will reflect on the consequences of the functioning of the abovementioned rules on the fundamental rights of individuals who will move to other celestial bodies on a temporary or permanent basis.

Bio: Dr Filippo Marchetti is a Senior Lecturer in Law and Technology at the University of Westminster (London) and an Adjunct Professor of International Law at Bocconi University (Milan). His expertise lies at the crossroads of Public/Private International Law, EU Law, and the substantive regimes regulating new technologies, while his current research focus is the impact of public and private international law regimes on manned and unmanned outer-space activities and vice versa. He previously worked as a Research Fellow in International Law at the University of Milan.He holds a PhD from Bocconi University and authored and co-authored several articles, chapters, and reports on private international law and technology law.

Reinterpreting the Rescue Agreement: Towards a New Human Rights-Based Framework for Future Space Missions involving Emerging Technologies

Dr Anne-Sophie Martin

The exploration and use of outer space are framed by the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies (Outer Space Treaty) and the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space (Rescue Agreement). The latter established the principle that astronauts are regarded as "envoys of mankind" and outlined obligations for their rescue, return, and protection. However, as human presence in space intensifies through state-led missions, commercial missions, and prospective long-term habitation, the adequacy of these accords in light of contemporary human rights standards needs to be re-examined, as not only astronauts will be going into space, but also individuals as tourists. The paper assesses the Astronauts Agreement through the lens of international and regional human rights law, with particular attention to the right to life, human dignity, privacy and data protection given the rise of artificial intelligence and quantum technology.

The paper highlights three key aspects. First, although the accords emphasize inter-state obligations to provide assistance, they remain state-centric and do not address the individual rights of astronauts as rights-holders. Second, the accords lack mechanisms for accountability in cases of rights violations, in particular given the growth of new technologies. Unlike terrestrial human rights regimes, there is no specific enforcement framework to tackle grievances arising in extraterrestrial environments, leaving astronauts, as well as individuals, reliant on political goodwill rather than legal guarantees. Third, ethical and legal issues, considering extended missions, and potential conflicts between crew members and participants, underscore the need to integrate human rights norms into space law. The paper argues that the 'human' spirit of the Astronauts Agreement provides a foundation for rights-based protections, but its scope is too limited to meet the complexities of new space missions. In order to align space governance with universal human rights standards, it is necessary to adapt existing accords in light of evolving technologies and new space actors, while also considering the adoption of instruments that recognize astronauts and individuals' rights in outer space.

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Human Rights Without *Terra Firma*: Legal Philosophies and Enforcement at the Final Frontier

Dr Vivek V. Nemane and Mr. Mahesh Sharma

As humanity prepares to settle the final frontier, this paper bridges classical human rights philosophy and the realities of space law to ask whether our "inalienable" rights endure beyond Earth. It charts the historical evolution from natural law and Enlightenment ideals (e.g. Kantian respect for persons, Rawlsian justice) to modern human rights instruments, then examines their extension to outer space. Existing treaties on space, from the Outer Space Treaty (OST) to the Moon Agreement, espouse cooperative principles and the common good of space activities. OST Article I declares outer-space as "for the benefit, and in the interests of all countries….without discrimination….on a basis of equality", echoing the proclamation under UDHR that "all human beings are born free and equal in dignity and rights". OST Article III embeds international law (and by implication human rights) into space governance, and Article VI makes states responsible for private actors' conduct in space. Yet gaps and unresolved tensions persist: jurisdiction, which nation's law (if any) applies in a lawless void; attribution, how to assign responsibility for corporate or multi-national missions; universality, whether human rights apply universally off-world despite cultural or legal divergence; and regulatory fragmentation, the risk of uneven national laws in an international domain. Treaties on Human rights like ICCPR, with obligations "within (a state's) territory, and subject to its jurisdiction" (Article 2), were never crafted for environments with no sovereignty, leaving future space inhabitants in a legal gray area.

In response, the paper advances three proposals. First, establish clear duty-bearing frameworks so that not only states but private space companies and international agencies are bound to uphold fundamental rights (e.g. through national legislation extending human-rights duties to space operations). Second, pursue treaty reforms or new instruments, for example, an outer space human rights protocol, to fill normative gaps (mirroring how OST Art I and the Moon Agreement's "common heritage" ethos seek equitable use). Third, it aims for developing detailed 'ethical charters' or basic rights agreements, ideally those missions themselves would rally to. Central tenets of it must include commitment to non-discrimination for all residents, ensuring colonists have basic life necessities guaranteed by right, and upholding due process against arbitrary decisions. This would be a push towards intentionally embedding human values into space governance to prevent them from being overshadowed or diluted.

Bios: Dr. Vivek Vishnudas Nemane is an Assistant Professor at Symbiosis Law School, Pune, a university recognized with Category-I status by the UGC and holding 'A++' grade accreditation from NAAC. He carries this institutional prominence, supported by his own extensive academic credentials including a Ph.D., LL.M., two M.A. degrees, and B.Sc. This combination of his diverse qualifications and more than eight years of teaching experience enables him to engage in significant legal education activities within India's premier legal academia.

Mahesh Sharma's academic work centers on Outer Space Law, with a significant focus on Public International Law. His interest in this complex field originated from his Master's degree research, which explored the applicability of International Humanitarian Law to astronauts conducted at South Asian University following his Gold Medal-winning B.A., LL.B. Currently, as a Teaching Associate at Symbiosis Law School in Pune, he contributes to legal education. Prior roles included Assistant Professorship at Jaipur National University and Visiting Faculty positions at Amity Law School.

Investment Law, Reconsidered: Human-Rights-Based Property Protection for Mega-Constellation Operators

Mario Nocerino

Satellite mega-constellations – vast fleets of satellites deployed in low Earth orbit as coordinated infrastructures – are among the most capital-intensive private ventures of the present era. They remain formally encompassed within the broad category of the "space object", yet their unprecedented scale unsettles the treaty framework: liability rules conceived for single artefacts, registration procedures premised on scarcity, and supervision obligations designed for limited numbers all falter when confronted with thousands of satellites manoeuvring algorithmically. In seeking protection for such investments, the temptation is to rely on the language of investment treaties – expropriation, fair and equitable treatment, legitimate expectations. Yet outer space lacks a bilateral investment treaty architecture, and investor–State arbitration would sit uneasily with a regime built around communitarian principles. More importantly, investment law's bias towards investor expectations over regulatory autonomy would be counterproductive in an environment where sustainability and public interest must prevail. Human rights law offers a more balanced path. Property guarantees under A1P1 ECHR, art. 21 ACHR, and art. 17 UDHR extend to legal persons and cover the assets on which mega-constellations depend: licences, spectrum filings, contractual rights, and satellites themselves. At the universal level, art. 17 ICCPR prohibits arbitrary interferences and has been read to include proprietary interests. Within the framework of Articles VI and VIII of the Outer Space Treaty – which tie private activities to State authorisation and supervision – these provisions ensure that measures such as licence revocation, de-orbiting mandates, or spectrum reallocations engage human-rights obligations. This paper argues that property, framed as a human right, should provide the legal basis for protecting operators while legitimating robust regulatory action.

The argument unfolds in three steps. First, the definitional gap is considered: "mega-constellation" does not appear in treaty law, yet these systems are subsumed as "space objects" even while their systemic scale exposes the inadequacy of inherited categories. They are ordinary in their units yet extraordinary in aggregate, warranting recognition as a distinct analytical construct. Second, property protection under human rights law functions as a stabilising mechanism comparable to investment law, but without insulating operators from regulation. Third, proportionality must be addressed directly. Mega-constellations amplify risks – collisions, debris cascades, interference with astronomy, foreclosure of spectrum – which justify strict regulation. But restrictions must be tied to those risks and articulated in terms operators can reasonably foresee; otherwise they risk becoming protectionist or retroactive. In conclusion, property as a human right secures investment against arbitrariness while enabling States to impose the sustainability measures orbital safety demands. Unlike investment law, which would distort the regulatory balance, human-rights protection delivers stability for operators and legitimacy for regulators, offering a credible path to stewardship of the orbital commons.

Bio: I am a PhD candidate in International Law at the University of Naples Federico II, where my thesis explores disputes arising from private satellite mega-constellations. My research investigates how space law and international law can respond to the growing role of private actors in outer space, focusing on responsibility, dispute settlement, and the interaction between States, companies, and institutions. Alongside research, I serve as Teaching Assistant at LUISS Guido Carli, where I lecture and supervise students in the Courses of International

Organisations and Human Rights. I have also been Visiting Researcher at the International Institute of Air and Space Law in Leiden, working closely with ESA staff and the space law community. Professionally, I practise as a lawyer and Of Counsel at E. Morace & Co., advising on cross-border disputes in maritime, civil, and insurance law, with experience in international arbitration and contract negotiation.

The Words Unsaid – An Analysis of the ADR-IOS Economy

Janneke Parrish

The economy of active debris removal (ADR) and in-orbit servicing (IOS) is as complex as the nature of the problem itself. While there are common trends throughout the industry, the reality is that each initiative has chosen to address a specific element of the space debris problem, with limited overlap between them. However, while there may be little overlap in terms of methodology, there is significant overlap in terms of marketing and messaging around these ADR and IOS services. This research uses textual analysis to trace the common messaging between ADR-IOS companies as well as the evolution of said messaging.

Despite the range of companies and services offered, this research suggests that the language and focus of the most successful companies in the ADR-IOS space is militaristic in nature. This includes focusing on defence-centric language, as well as seeking out specific partnerships with military entities. Given the nature and potential ramifications of the space debris crisis, that efforts to resolve it have a militaristic focus creates an interesting question of the intersection between space sustainability and human rights. This research explores that intersection and its implications for the long-term future of sustainable space development.

Bio: Janneke Parrish is a PhD candidate studying space law at the University of Waikato. Her primary interests include tech law and human rights – especially labour rights – in an increasingly tech-centric world. She is also the author of "The Tech Worker's Guide to Unions."

Space Law and Human Rights – Regulating Corporate Duty in Extraterrestrial Settlements

Dr E Prema and Ragul OV

Humanity's push toward extraterrestrial settlements raises urgent questions about how fundamental rights apply beyond Earth. Existing space treaties bind only States and largely omit explicit guarantees for individuals. The Outer Space Treaty requires activities to be carried out in accordance with international law, including the Charter of the United Nations, which encompasses basic rights, yet no treaty explicitly lists settlers' rights. A central question is whether rights like life, equality and self-determination can remain meaningful in off-Earth communities, and who (States or private corporations) must be held responsible. Under current law, State parties bear primary responsibility. Article VI of the OST makes each State internationally responsible for national activities in space, including those of its private entities, but it does not itself codify rights for individuals. Similarly, UN business-and-human-rights guidelines require businesses only to respect rights and deem States' protective duty as largely territorial. In practice, few national space statutes mention human rights. Freeland and Ireland-Piper observe this analytic gap and support calls for a specialized forum to adjudicate private actors' conduct in space. Macchi likewise warns that international space law is currently ill-equipped to ensure accountability of corporations, highlighting that emerging due-diligence norms may help fill these gaps. Looking forward, scholars suggest adapting terrestrial laws for the final frontier. General Comment No. 24 on the ICESCR affirms that a State influencing corporate actions abroad may incur extraterritorial obligations. Likewise, the EU's 2024 Corporate Sustainability Due Diligence Directive now requires large companies to identify and address human-rights harms worldwide. This paper therefore examines how rights treaties, soft law and new domestic rules might be reinterpreted or expanded to protect space settlers. It concludes that without such adaptation, the rights of future spacefarers may be in peril, and Ahmed reminds us that human rights principles can inform multiplanetary existence while advancing mechanisms that strengthen corporate accountability.

Bios: Dr. E. Prema is Professor of Law at VIT School of Law, Vellore Institute of Technology, Chennai, India, specializing in Constitutional and Public International Law. With over fifteen years of teaching and research experience, she has engaged extensively with questions of human rights, international law, and space governance. Her research has been presented globally, including at the United Nations Office for Outer Space Affairs (UNOOSA), the University of Salzburg, and Utrecht University. She has delivered keynote lectures and published widely on the intersection of international law, technology, and human rights, with recent work addressing cybersecurity in outer space, lunar heritage protection, and the regulation of mega-constellations. As a recipient of the Erasmus+ Staff Mobility Fellowship and fully funded UNOOSA panelist, she has actively contributed to shaping debates on space law and sustainability. Her current work explores corporate accountability and the protection of fundamental rights in extraterrestrial settlements, aligning closely with the conference theme.

Ragul O.V. is a Legal Researcher at the High Court of Madras and an alumnus of VIT School of Law, Chennai. His research interests lie at the intersection of constitutional law, space law, and human rights, with a focus on the legal regulation of emerging technologies and extraterrestrial governance. He has presented internationally, including at the University of Greater Manchester on Martian governance, the National University of Singapore on decarbonised shipping law, and the University of Strathclyde on lunar heritage and space waste.

He has also spoken on sovereignty and human rights challenges in conflict regions, demonstrating a comparative and interdisciplinary approach to international law. His publications include peer-reviewed work on space law, energy security, and EU constitutional tensions. An active contributor to legal education, he co-organised “Up Above the World So High: Exploring Frontiers,” a space law initiative engaging students and scholars. His current research examines corporate due diligence in future space settlements.

From Homo Sapiens to Homo Spatiens? Rethinking the Human Subject of Rights Beyond Earth

Nivedita S

The starting point of human rights law is the idea that there is a clear subject: the human being. However, the idea of life and settlement on other planets challenges this basic category. Human physiology and psychology are significantly altered by space travel, and long-term survival outside of Earth might require artificial intelligence, genetic engineering, or cybernetic enhancement. These modifications beg the question, "Who or what will be the human rights bearer in space?" Drawing on philosophical stances from humanism, posthumanism, and bioethics, this essay explores, firstly, the concept of "the human" in relation to extraterrestrial life. It first considers whether human rights should be limited to biological humans or extended to hybrid or technologically advanced beings. Second, it raises the question of whether it is possible to rethink the terrestrial foundation of human rights, which has historically been associated with Earth, territory, and state sovereignty, in non-terrestrial contexts. Third, it considers whether, in light of the ethical imperatives of protecting the planet and responsibilities to non-human environments, anthropocentrism itself ought to be contested in space law. By situating these discussions within the evolving relationship between space law and human rights, the paper advances the claim that conditions on other planets necessitate a pluralistic and flexible understanding of "the human." A forwardthinking framework must anticipate the rise of hybrid and posthuman beings, protect astronauts, space tourists, and future settlers, and be open to duties that go beyond the duty of humanity. Law and philosophy can only address the transformative reality of life beyond Earth by broadening the conceptual parameters of human rights.

Bio: Ms Nivedita S is a Research Fellow at the Centre for International Law, National University of Singapore. Her work explores international law and policy issues spanning energy, oceans, space, security, and the environment. Her research focuses on the conceptualisation of international energy law, legal and policy frameworks for energy justice and the clean energy transition (including governance of critical minerals), nuclear applications at sea and in outer space, and the development of regional energy norms. She is particularly interested in the intersections between different branches of international law and exploring interdisciplinary approaches that consider historical, social, and cultural dimensions in shaping legal frameworks. Nivedita has previously worked with international organisations, NGOs, and other institutions on nuclear law, human rights, environmental law, international criminal law, and gender issues. She is an active member of the BASIC Emerging Voices Network and the Law, Literature and Humanities Association of Australasia

Human Rights in Outer Space: Lessons from Human Rights Enforcement on the High Seas

Nicole Santiago and Peggy McGregor

The interplay between human rights frameworks and the United Nations Convention on the Law of the Sea (UNCLOS) has created unique challenges for human rights enforcement. As an extra-territorial space, the high seas have pioneered various challenges related to the regulation of private and public activities and the protection of human rights, as well spurred the creation of innovative governance mechanisms to reconcile state practice and human rights law. This article explores how the protection of human rights on the high seas can serve as an example for another extraterritorial place: Outer Space. This article will specifically examine the accountability mechanisms established under UNCLOS and the extraterritorial application of the European Convention on Human Rights, as interpretated by the European Court of Human Rights, both in theory and practice as evidenced by case law. This article will also delve deeper into the potential applicability of European human rights law to Outer Space through the notion of personal control. The article addresses the procedural issues related to specific and distinctive legal features of non-territorial and non-sovereign spaces, States' extraterritorial jurisdiction and human rights extraterritorial application, and universal jurisdiction versus extraterritorial jurisdiction. The article then addresses substantive issues related to five human rights: the right to life; the prohibition of torture; the right to liberty and security; the right to a fair trial; and freedom of expression. In each section, the authors discuss whether existing interpretations of human rights for the high seas are suitable for the unique characteristics of the Outer Space environment and, where relevant, propose suggestions to tailor current approaches to address foreseen challenges to interpretation and enforcement in Outer Space.

Bios: Nicole Santiago is an international human rights lawyer specialised in human rights and technologies. In her current role as Research Manager at Trilateral Research Ireland, she leads work on legal research and policy advocacy to support the development of responsible technology ecosystems, including work on AI, space-based technologies, climate engineering, and neurotechnologies. She previously worked as an Associate at Perseus Strategies, a human right law and consulting firm in Washington, DC. She has taught on human rights and humanitarian law at The American University of Paris, French War College, and the Université Catholique de Lille Law School. She holds a JD from Northeastern University School of Law (Boston) and MA in Diplomacy and International Law from The American University of Paris.

Peggy McGregor is a Legal Advisor in the Office of the Law Armed Conflict for the French Ministry of the Armed Forces in Paris. Previously, Commissaire Mc Gregor served as legal officer for law and maritime issues in the Directorate for Legal Affairs at the French Ministry of the Armed Forces, deputy to the head of the French Navy HR policy department, legal advisor to the head of the center for the operations planification and conduct (CPCO) at the strategic level in Paris, and as a senior advisor for law enforcement at sea and International Relations. She has also been deployed as a senior legal advisor to naval operations dedicated to the enforcement of the arms embargo and the fight against the human smuggling business model in Libya. Commissaire McGregor is a graduate of Sciences Po Paris and the Ecole de Guerre (French War College).

High-Speed Dreams in the Outer Space, Grounded by Inequality: Starlink and the Privatization of a Human Right

Dr Ilona Schembri

The United Nations acknowledges access to the internet as a fundamental human right, essential for realizing various other rights, including access to education, information, public services, and civic engagement. However, despite this recognition, many people around the world—especially those in rural and remote areas—still struggle with limited or no internet connectivity. This paper begins by exploring the ongoing challenge of digital exclusion in these rural and remote regions, where building traditional internet infrastructure is often too costly or simply not feasible. It then argues that satellite-based services, particularly SpaceX's Starlink—which operates about 65% of the active satellites in orbit—have emerged as a promising technological fix. By launching constellations of low-Earth-orbit (LEO) satellites, Starlink can deliver high-speed internet to areas that have long been underserved. However, this paper argues that while Starlink represents a technological breakthrough, it also introduces an economic concern. This paper contends that the privatized nature of Starlink undermines its potential impact in these rural areas. This paper determines that as a for-profit venture, the service provided imposes high subscription costs that, in many regions, are equivalent to or greater than the average monthly income. Consequently, the communities that stand to benefit the most often remain digitally excluded.

The analysis then extends to the broader ethical and legal implications of private control over space-based satellites as this fundamental human right is entrusted to private corporate entities. This paper argues that the current landscape, dominated by corporate actors such as SpaceX, falls short of this vision. Central to this discussion is the Outer Space Treaty, which stipulates that space shall be used for the benefit of all humankind. This paper determines that in the absence of robust public oversight, internet access is at risk of becoming a commodified privilege. It demonstrates that access is further restricted by geopolitical constraints, as seen in countries like Chad and Syria, among many others. In conclusion, this paper advocates for greater international collaboration, fair pricing strategies, and more involvement from the state sector to ensure that satellite internet lives up to its potential as a means of global inclusion. To uphold access to the internet as a fundamental human right, governments and societies must demonstrate a collective and shared commitment to the principles outlined in the Outer Space Treaty, with a focus on equitable access rather than solely pursuing commercial gain.

Bio: Dr. Ilona Schembri holds an LLB from the University of Malta, an LLM from Queen Mary, University of London, and a PhD from the University of Birmingham. She is currently a lecturer at the University of Malta and a visiting lecturer at Queen Mary, University of London. Her academic interests span international law and human rights, with a growing focus on the emerging field of outer space law. Although still a relatively new area, particularly in Malta, Dr. Schembri is deeply engaged in exploring how legal developments beyond Earth's atmosphere can have profound implications for fundamental human rights here on Earth. She is especially interested in how privatized access to space-based technologies, such as satellite internet, intersects with principles of equity, accessibility, and global justice. Through her teaching and research, she aims to raise awareness about the urgent need for inclusive and ethical governance of outer space.

Space Business and the Individual: Embracing Natural Law and Property for Human Rights in Outer Space Commerce

Scott Schneider

Among the unanswered legal questions with the increasing commercialisation of space affairs is, to what extent non-state activities in outer space compromise human rights? The present research approaches this question by distinguishing between individual rights under natural law and human rights under international law. The paper then outlines the space-related frameworks for human rights and considers several key insights from existing publications on the subject of human rights and space. This historical and literature review provides context for evaluating the proportion of risk to human rights shared between market actors and political actors. The purpose of such an evaluation is to determine the gaps left by current international human rights law in protecting the individual and facilitating welfare in society. The solution presented to addresses these gaps begins by recognising where market-based property in space is in the interests of due diligence for human rights. This approach remains within the scope of the key space law provisions including article VI of the Outer Space Treaty concerning state responsibility for non-government space affairs. The conclusion of the research proposes core building blocks for policy approaches by states and international organizations when seeking to prevent harm to the individual while facilitating the benefits of space commerce being experienced by as many people as possible.

Bio: Scott Schneider is a Solicitor with the International Aerospace Law & Policy Group

The Human Right to Dark Skies: Cultural Preservation, Scientific Inquiry, and Justice in Outer Space Governance

Shrawani Shagun

The night sky, a shared heritage essential to many cultural identity, scientific discovery, and environmental sustainability is facing an existential crisis due to the proliferation of satellite mega-constellations and pervasive light pollution. This paper asks a critical legal question: Should access to dark skies be recognized as a fundamental human right, and how must international law and governance adapt to protect it? If the current space law regime, is fatally inadequate? How the principle of "freedom of use" for outer space now functions as a license for orbital appropriation, neglecting the intangible, collective interests embedded in dark skies? The gap disproportionately harms Indigenous peoples and Global South communities, whose celestial navigation, cultural practices, and cosmological knowledge are marginalized under the current governance framework. Using a Third World Approaches to International Law informed lens, it demonstrates how space and environmental law perpetuate neo-colonial structures, privileging commercial interests in the Global North over the collective planetary heritage. There is a need of normative framework recognizing access to dark skies as a Global Commons. proposed enforcement mechanisms include integrating international human rights obligations such as the rights to culture and science into space permitting, strengthening domestic controls on terrestrial light pollution, and mandating corporate due diligence for satellite operators. Recognizing dark skies as a human right is not merely an environmental or scientific concern, it is a moral and legal imperative. Such recognition ensures that the expansion of human activity into outer space aligns with principles of justice, equity, and the protection of humanity's shared celestial heritage.

Bio: Shrawani Shagun is a legal scholar specialising in space law, focusing on environmental sustainability, climate action, and the regulation of space activities. As a Max Planck Scholarship recipient, she researched as a guest scholar at the Max Planck Institute Luxembourg. She is a member of the International Institute of Space Law. Shrawani holds an LL.M. from the University of Delhi and a B.B.A., LL.B. (Hons.) from ICFAI University, Dehradun, where she graduated as a gold medalist. She has made significant contributions to academic and professional discourse through her teaching, research, and policy engagement. Shrawani has shared her work on platforms such as the UN/Austria Symposium in Graz, where she discussed integrating climate science into space policies, and the UNITAR Research Conference in Bonn, where she chaired a panel on the role of space technology in climate security. Her research contributions and publications advocate for sustainable and equitable space governance, aiming to address the legal and ethical challenges posed by expanding space activities while ensuring environmental sustainability and intergenerational equity.

In Space, Can the Other Side Be Heard?

Dr Alexander Simmonds

Travel to, exploration—and potential colonization—of Mars has been a long-held ambition for certain spacefaring nations. Indeed, travel to the Moon has already been accomplished, and Astronauts have operated in Earth's orbit since the 1970's. That states on Earth continue to exercise legal jurisdiction over astronauts in space is a matter of little controversy and, to date, such utilisation, at least in a criminal sense, has not been fully realised. Communications latency, a phenomena arising from what is observed in Einstein's theory of Special Relativity, however, has the potential to significantly disrupt any such realisation in a number of ways which could have a palpable impact on matters relating to Human Rights including the right to a fair and public hearing enshrined under Article 10 of the UNDHR and elsewhere. Legal disputes arising between those on Earth and those in what could be termed 'deep space' -under the ITU definition- or as far away as Mars will have to be constructed so as to avoid any flagrant breaches of the article. Hearings conducted in an adversarial manner using the engine of cross-examination have the potential to cause alarm and distress in such instances in addition to largely being ineffective. Further, when is an individual 20 minutes away from Earth at the speed of light deemed to be bound by legislation passed thereon? Would, by the frame of reference of the astronaut, any such legislation be deemed 'retrospective' in effect and thus potentially breach Article 11 (2)? Beyond this realm and into the fantastical and speculative, should near-lightspeed travel be accomplished, the implications of the phenomena known as 'time dilation' could prove to have mind-bending consequences for the law and the human rights guaranteed under it. Whilst reservations remain over the feasibility of human exploration and possible eventual habitation of Mars, and no definitive time-frame is set for such a venture, if the human race is to survive beyond the projected life-span of the Earth, long-distance space travel incurring significant communications latency (barring any drastic technological solutions) will be born of necessity. In this sense at least, such matters warrant intensive consideration so that the rule of law and, indeed, human rights, can also take a 'giant leap'.

Bio: Alexander Simmonds is a Lecturer in Law at the University of Dundee in Scotland. Following the completion of a degree in Law from the University of Sheffield and post-graduate study at Nottingham Law School, Alex was called to the bar of England and Wales in 2008 at the Honourable Society of the Inner Temple. Alex received two Attorney General's Commendations and was nominated for the 2008 Bar Pro Bono Award in respect of a project he began as a student whilst studying the Bar Vocational Course at Nottingham Law School. He is a Fellow of the Higher Education Academy and holds a PhD in Employment Law from Coventry University.

Legal and Policy Challenges of New Technology including Artificial Intelligence (AI) for Human Rights Protection in the NewSpace Economy

Helen Tung

The NewSpace economy, marked by rapid commercialization and private sector innovation, is reshaping space activities through advanced technologies such as artificial intelligence (AI) and autonomous systems. While these developments offer transformative opportunities in Earth observation, telecommunications, and space exploration, they also raise profound legal and human rights challenges—especially concerning data privacy, accountability, and equitable access.From the perspective of the rule of law, a fundamental question arises: which legal frameworks govern these emerging activities? The traditional international space law regime, rooted in the Outer Space Treaty and state responsibility principles, faces significant strain in addressing the complexities introduced by privatization and commercial entities operating across jurisdictions. This paper critically examines the applicability and limitations of current legal instruments to AI-driven commercial space operations, highlighting gaps in regulation, enforcement, and accountability.The privatization of space activities intensifies challenges around ownership, liability, and governance, as private actors undertake roles historically reserved for states, raising questions about how legal responsibility and human rights protections can be effectively maintained in a rapidly evolving environment. As a bridge to the present day, the paper offers a brief overview of the current state of research and commercialization within the NewSpace sector, noting key trends such as the proliferation of small satellite constellations, advances in AI-powered analytics, and the rise of public-private partnerships. It underscores the urgent need for collaborative, rights-based legal frameworks that ensure technological innovation aligns with human rights, sustainable development, and international cooperation in space.

Bio: Helen Tung is a qualified barrister and international lawyer specialising in cross-border dispute resolution, international arbitration, and public international law. With a global practice spanning the UK, Middle East, and Asia-Pacific, she advises clients on complex legal issues involving jurisdictional challenges, enforcement of foreign judgments, and transnational disputes.Helen has worked with governments, international organisations, and private clients, particularly in sectors such as international trade, maritime, family offices, and emerging technologies. She brings a multidisciplinary approach to her work, combining legal expertise with a strong understanding of international relations and regulatory frameworks. Currently affiliated with the University of Huddersfield, Helen integrates academic research with legal practice, focusing on dispute prevention, regional legal cooperation, and international governance. She frequently speaks at international conferences and contributes to legal publications on dispute management and cross-border legal systems. Helen is committed to fostering practical, collaborative solutions to complex international legal disputes.

Embedding Human Rights in Outer Space Governance and Practice: Securing Buy-In for Sustainable Futures

Jez Turner and Dr Juliana Rinaldi-Semione

The accelerating role of private corporations in outer space activity has pragmatically shifted the balance of responsibility for future human settlements and critical infrastructure. While the Outer Space Treaty affirms that activities must be conducted 'in accordance with international law,' its state-centric framework leaves private actors without explicit human rights obligations, which sit at the international level. The absence of such obligations risks leaving extraterrestrial settlements and vital infrastructure vulnerable to exploitation, opacity, and rights violations – in short, to social unsustainability. This paper adopts a *de lege ferenda* perspective to explore how human rights protections can be embedded in outer space governance and practice through education, corporate engagement, and pragmatic tools. From our higher education context in both SHAPE and STEM disciplines, we argue that universities and educational initiatives, as non-governmental actors, can serve as catalysts for cultural and normative change. By equipping future professionals with the tools to question and influence corporate practices, education can generate 'ambassadors' who carry human rights awareness into industry and policymaking.

Drawing on the 'ethical satellite build' in a classroom setting as pragmatic evidence, we show how structured educational interventions can normalise discussion of human rights and sustainability in technical and corporate contexts. Questionnaire responses from participants illustrate both the appetite for, and the challenges of, operationalising these concerns in practice. This case study also highlights the broader pressures of globalised supply chains, corporate dominance, and the logistical fragility of off-Earth settlements. We theorise—and begin to practice—that preserving future generations' ability to meet their off-Earth needs depends upon bringing the present, nascent generation alongside. Through education, buy-in, and the normalisation of human rights discourse, the social dimension of sustainability can be embedded into the foundations of space activity. Our contribution is twofold: first, to demonstrate the pragmatic value of embedding human rights discourse in educational and corporate practices; and second, to argue that by normalising cross-sectoral dialogue and providing actionable tools, human rights can be meaningfully protected in the emerging era of multiplanetary human activity. In doing so, we contend that the protection of human rights in outer space requires not only legal change but normative advocacy. Practical toolkits can socialise both and convert them into action for a socially sustainable future off-Earth.

Bios: Jez Turner is a Senior Fellow of Advance HE, Member of The Institute of Physics and Member of the Space Universities Network. I taught for 12 years in Secondary Schools and now teach on the University of Nottingham's Foundation Engineering and Physical Sciences and Electro-Mechanical Degree Apprentice programmes. I deliver Ethical Satellite design, make and test projects as well as an aerofoil design and build project. I teach Applied Engineering and basic rocket engineering/science (with real UK rocket engines from the 1960s/1970s). I also deliver outreach to schools and larger events to the public as part of our public engagement activities on space, sustainable development and UN's Sustainable Development Goals. I have delivered public lectures to hundreds of people on how engineers landed people on the Moon and how space can be accessed with all our senses, particularly for blind/partially sighted people and people with special educational needs.

Dr. Juliana Rinaldi Semione is Research Fellow in Future Worlds & Freedom at the Nottingham University Business School. She also leads the SDGs in Space project. Juliana's research centres on applied space ethics from a Sustainable Development Goals (SDGs) framework, including applications for off-Earth governance and social structures. She is passionate about synthesizing disparate voices and research to implement creative solutions to complex, real-world problems. Juliana delivers curriculum design and teaching to integrate the SDGs in the Faculty of Engineering and the Business School. Drawing on additional experience as an impact professional, Juliana also designs pathways for evidence uptake among policy and industry stakeholders across the Faculties of Engineering and Social Sciences. Juliana has previously worked in the public and third sectors, focusing on operationalizing human rights locally. Juliana holds an MA from the King's College London School of Law and a PhD from the University of Nottingham.