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On Libertarian Communities in/around Outer Space: Is ecology an antithesis to liberty?

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When discussing institutions governing (future) outer space utilisation/inhabitation, an age-old tension reemerges between systemic interdependence, singularity of motivation and commonality of criticality. Within any closed ecological system, “activities of life” are interrelated in a way that contradicts the singular motivation of any individual one. When moving away from the originating environment, this interdependence is underlined further by the emerging challenges to life’s survival. In this paper, I examine the interplay between a potential configuration of these tensions based on recognising ecological systemisation as a way to mediate between individual visions and common challenges and the opportunities and threats to liberty it presents through techno-ecological perspective.

Keywords: ecology, society, technology, governance, outer space

1. Ecosystem as Analytical Framework for Governance

Ecosystem is defined as the relationship between the totality of an environment (biotop) and all living entities within (biocenosis). As such, the mutual dependency between the living space and its inhabitants creates an interlinked web of (balanced) constraints and affordances, that on one hand make life possible and on the other hand constrain its form and abundance. Hence, an ecological framework is by necessity limiting absolute liberty of living beings, since their life cannot exist outside of a favourable ecosystem. In other words, our (mutual) dependence on ecosystemic services of other living organisms and our common reliance on the non-living environment, forces us to behave in a considerate way, or face system-wide disruption that may threaten our survival and that of our co-habitants.

The expansion of our living space into Outer Space creates a two-way pressure on the ecosystem. On one hand, living organisms need to adapt to the environmental conditions and re-align strategic partnerships with co-dependents. On the other hand, the new environment gets somewhat reconfigured and modified to suit the requirements of the living organisms through their activities upon and with the non-living matter. Furthermore, the “expansion” of ecosystemic framework allows for new perspectives on the existing conditions of life and a re-evaluation of our responses to the existing and new affordances and constraints.

In particular, when looking at the extreme conditions of Outer Space, two critical issues emerge. The environmental constraints placed upon living organisms are so severe, that only a technological intervention allows for their survival. However, with the technology-assisted survival comes

dependence to the source of technology, which is a social conditioning that can be used for control and deprivation of liberty. Most often, survival strategies at extreme environment require knowledge and skill beyond any individual. Hence, communities form as ways to develop and retain a stable configuration of relationships between organisms and their embeddedness in the biotop. Rule based systems of behaviour such as hierarchical command structure or value system for resources are both at the core of enabling the success of community organisation(s) to distribute risks to individuals and benefits to all. This is linked to the need to aggregate and understand complex systems in an actionable, practical way.

Second issue is that the critical environment in outer space lends itself particularly strongly to a re-evaluation of the preciousness of the existing ecosystem. It is well documented since the early days of space programmes, that a transformative cognitive shift occurred to astronauts when they left our planet's atmosphere, as they all found looking "back" towards the Earth much more awe-inspiring than looking "forward" into the blackness of outer space (White, 1987). Moreover, iconic "back-looking" imagery, such as the Apollo 8's *Earthrise* – the Earth appearing over the lunar horizon – captured public imagination in ways transcending the fascination with the stars and other celestial bodies.

This essay will examine the interlinking of these two issues with a view to understand the governance framework conditions in outer space. It will start by reviewing critical contribution of Social Studies of Outer Space to the understanding of the "expansion" of ecological framework into outer space through examination of sociotechnical imaginaries – a type of future visions shaping collective behaviour (Jasanoff and Kim, 2009). Furthermore, it will expose a core tension between how the introduction of technology to challenging environment established a (libertarian) communities of interest within and beyond Earth's orbits whilst at the same time changing the conditions of the environment to force new constraints upon the liberty of the participants. Finally, the essay concludes with an attempt to resolve this tension through an acceptance of "techno-ecological" co-dependency in a way that recognises the need to work within the "extended" environment (more) independently from the original ecosystemic framework as a way to establish a new framework of liberty within the constraints of the ecological reality.

2. Expansion of Ecological Framework to Outer Space

The near-Earth Outer Space is getting increasingly "occupied" by technological means, i.e. the introduction of artificial satellites to receive and transmit information and in some cases harbour life (e.g. space stations). This led to the establishment of business interests and civic visions for utilisation of space resources and led to the Outer Space "invading" everyday life through the emergence of Earth-Space economy. Coupling these developments with the broad liberalisation of social structures and an increase of public participation in governance and innovation of technology domains, a critical need has arisen for social science to analyse and (more actively) co-shape the emerging discussion about techno-scientific futures and societal impacts of life with/in Outer Space. At the moment, social science is somewhat lagging behind these aims, hence an integrated programme of research is emerging in Social Studies of Outer Space (Alvarez et al., 2019). It has been particularly recognised that due to the multi-dimensional proliferation of this field, a need arose to examine a more systemic view of Space Exploration and Industry, focusing on systemic and ecological dimensions and perspectives (Vidmar, 2020).

More specifically, Social Studies of Outer Space have in recent years focused on a mixed enquiry of the cultural framework for space exploration and industry, especially anthropological studies of the way space is "constructed" through discourse and practice (Messeri, 2016). This is further enhanced

by the direct analysis of sociotechnical imaginaries (Tutton, 2018), as well as how they interlink with framework(s) of (risk) governance (Vidmar, 2019) and (neo-)colonisation (Alvarez, 2020). Particular interest is being paid to the contention between the public discourse surrounding these visions, their “ground-truth” within the socio-political and economic context, and the social structures they (re)produce. Three techno-scientific (eco)systems are especially prominent: expansion of human settlement to/in outer space, the appropriation of outer space and its resources and the jarring juxtaposition to the state of the Earth’s environmental and social reality and future outlook.

Lead protagonists, both in the private and the public sphere, are advancing utopian narratives of the seamless expansion of our ecosystem into outer space as a/the “solution” to the Earthly challenges as well as an opportunity to re-set or at least reconfigure the broken environmental and social relationships. Especially strong narratives have formed around Martian and Lunar environments as settings for future cooperative “villages” (“Moon Village Association,” n.d.) and “settlements” (“The Mars Society,” n.d.). Similarly attractive seems to be the space in-between, despite its lack of planetary affordances such as firm ground, or perhaps precisely because of the absence of land-based constraints (“Asgardia - The Space Nation,” n.d.). Using well defined Earthly challenges, such as the sustainability crisis, geopolitical inequality and infighting, and potential cosmic existential threats (i.e. catastrophic meteorite impact), prominent individuals, community groups as well as popular culture productions call for investment in technology that would enable relocation of people into the imaginary (places). It is important to note, that these narratives are far more prevalent in the Western cultural sphere, where a post-humanist version of settler colonialism to right the historic wrongs in the form of astrofuturism (Kilgore, 2003) is both echoing the Western approach to colonisation as well as promising a new dawn of more integrated humanity. Exactly how such a transformative process is to be achieved is often left undefined.

Hence, more than ever before a social scientific study of the technical systems underpinning these expansionist narratives is vital. Especially important to address is the seeming re-emergence of practices of place-making that ignore or minimise the impact of environmental constraints on the establishment and evolution of social relationships and structures. At a time of emerging technical capability to enact these imaginaries, this is particularly worrying. In absence of robust critique, naïve metaphors are emerging as a way to describe solutions to concerns around the implications of space exploration and settlement. For example, it is increasingly apparent that space exploration since 1950 employed unsustainable practices, such as discarding disused material and equipment – not only in “wastelands”, but also in or near valuable locales, such as low and mid Earth orbit. The issues of “space junk” are now increasingly apparent, in particular in conjunction with some brash attempts at demonstrating space “power” and disintegration of assets – creating even more numerous and harder to control debris. The “remote” location of such places and incidents does not inspire the same urgency to address these issues, as would environmental pollution more central to our living space (e.g. oil spills). Nonetheless, the proposed solution is the same – the practice of “cleaning”. Through such an everyday metaphor, the problem appears to be “solved” even though the application of an actual “cleaning” solution is still in most early stages of development, it is very likely inadequate to deal with the totality of the issue, and the criticality and immediacy of the danger is severe. Noting such examples of a very acute lack of any understanding of the transformative process the emerging space imaginaries represent or indeed lack of any evidence of them being properly considered at all, makes a social scientific study of the interrelation between ecological and technological expansion into outer space essential.

3. Libertarian Communes in Outer Space

In order to better understand the ecological constraints and affordances within outer space context, the imaginaries giving rise to them need to be looked at in more detail. Especially interesting are the references given within these narratives linking the understanding of Earthly ecosystem to the social structures emerging in the new expanse. We turn to two particular sociotechnical imaginaries, Elon Musk's ambition for one million strong society on Mars by 2050 and the Space Nation – Asgardia. In essence, both these projects offer a sort of utopian libertarian communes with self-referential ecology and governance, free from Earthly constraints. Though approaching the imaginary future in space from different perspectives – Musk from technology side and Asgardia from the social dimension, they centre on an age-old premise that the new environment will give rise to a new (better) community organisation.

The more publicly visible amongst these plans are Elon Musk's stated intents to develop large-scale transportation system which would enable one million people living on Mars in a matter of decades (Drake, 2016), though he initially started off by a more modest goal of 80,000 (Coppinger, 2012). His focus is primarily technological – his first priority is to develop rockets big enough to carry payloads required for such an operation. Interestingly, the objective to settle Mars has been his stated goal all along, the SpaceX more commercial programme of satellite launches and support for human spaceflight programme only means to achieve that end. Communicating his vision in a series of keynote presentations, interviews and tweets, Musk promises all ingredients for a prosperous settlement. Echoing the narratives of the American Dream, he claims Mars "will be the planet of opportunity" noting that "There will be a lot of jobs on Mars!" Important to note is that outer space environment constraints mean that journey to Mars is on a one-way ticket, it being energetically impractical to have any return missions in the first phase of the settlement. In an similarly structured project called Mars One, thousands of people applied for a one-way ticket to a "big-brother"-type reality TV show set on Mars (Tutton, 2018). Though the project ultimately failed (Foust, 2019), it demonstrated that without considering the actual ecological reality, the vision of an underspecified libertarian space commune is very much appealing.

Speaking of the settlement itself, Musk is far more vague, whilst noting humans will have to live in "glass domes at first" his future plans revolve around terraforming the red planet, including detonating nuclear explosions over Martian poles to extract carbon dioxide and water (Walls, 2019). Either way, two clear visions are set for the Martian settlement in this imaginary – the environment is to be occupied by technological means and the commune/ity established in its wake is to be libertarian in its outlook. This exposes the core naiveté or lack of consideration of the need to shape the (eco)systemic evolution of the expansion into the new ecological framework. Matters of environmental challenges – such as high energy radiation – are often brushed off as "technical problems" or even a matter of chance. In an interview, Musk noted that "a bunch of people will probably die at the beginning" (Gorgan, 2021), and commenting at other times that one of the settlers characteristics should be the spirit of adventure unafraid of peril. However, based on the public reaction to such statements, the constraints of journey to Mars and settling there seems to represent an infringement on the people's liberty to a degree largely unacceptable to most, though not all. The dependence on a set of available technologies is likely conditioned with trust in their performance and a degree of dependence, both of which include a system of social relationships. Here, the implication is clear – you have to believe in Musk's vision and his technology in order to accept the risk to place your life in the hands of his engineers. Moreover, you seemingly have little recourse to move outside of such ecological governance framework once in outer space, if you do lose faith. In short, under technology-first view of outer space settlement, your liberty is the price to pay for the "opportunity".

However, not all imaginaries of future space communes are so techno-centric. Perhaps the most well known and most developed social imaginary of the past decade is Asgardia, a proposal for a non-territorial space settlement, offering supra-national (or “transnational”) libertarian governance and a “citizenship” model based on membership application, with tiers: at the moment, that includes free “followers” as well as fee-paying “residents”. The promise is that earthly squabbles of the old kind are banned, singling out religion and politics as two such contentions. In the words of its founder and Head of Nation, Igor Ashurbeyli: “Asgardia can offer the entire Earth civilization an alternative way.” Their stated aims are to create “a fully fledged independent digital state recognized by earthly nations” and “ensure peaceful space exploration, protect our home planet from cosmic threats and lead the development of new Space Law to eliminate militarization of space” (“Mission,” n.d.). This extends to “facilitating the first human childbirth in space”, which they add would lead towards human “immortality as a species” – an echo of the visions of transplanetary settlements as guarantees against existential threats on Earth.

Claiming over 1 million “Asgardians” have joined the project, it certainly seems an appealing proposition to leave behind past conflicts and constraints of earthly relationships and start building a new social organisation of equals. The plan is that one day, they could do so physically – move to leave in a massive orbital space station (“space arc”) or even on the surface of the Moon or Mars. For the moment, though, the only Asgardian physical presence in space is in the form of a small (2.7kg) satellite bearing its name and containing digitally stored photos of its members, state symbols and documents and two particle detectors to examine the space environment. The mission’s aims are two fold – to test the durability of solid-state drive storage under radiation conditions in the low earth orbit as well as serving as Asgardian “extra-terrestrial territory”, under which they would like to be recognised as a state by the UN – unlikely prospect according to legal analysts (Alshamsit et al., 2018).

However, the challenge of this particular (social) expansion into outer space is not only reflecting on the limitations of the existing political organisation on Earth, but also its almost inevitable reproduction in the new expanse. Though claiming to be “totally democratic”, Asgardia’s is described as “constitutional monarchy”, due to “kingdom” having “magical” meaning and invoking religious connotations and correspondingly almost absolutist executive power is vested in the Head of Nation with little transparency as to the decisions taken (Harby, 2018). Curiously, similarly to Musk, Ashurbeyli is a billionaire, retired from his original business (in defence manufacturing) and uses his profile and wealth to forward this imaginary. This illustrates that even when the primary objective is a more holistic approach at place-making beyond the Earth, the realities of practically implementing a framework of governance falls well short of the stated libertarian ambitions of organisations “beyond” state.

Though perhaps lacking in the realisation of their forward facing libertarian (re)configuration, these socio-technical entities are already ecologically disruptive. Though Musk’s SpaceX have not yet developed a settlement, they have established a small foot-hold in the off-Earth ecosystem by introducing satellites, rocketed bodies and other material to it. That expansion has also yielded a reflection on the existing (Earthly) ecosystem, for instance by forwarding technological/material reusability and redefining commercial business models for space-Earth economy. It also highlighted the ethical and practical challenges of expansion into the outer space, especially in a libertarian way. The test launch of SpaceX’s Falcon Heavy rocket in 2018 was the means of pushing a car (Musk’s Tesla Roadster) into space as a sort of publicity stunt – making the ultimate example of “space junk”.

While aesthetically perhaps more pleasing than blocks of concrete used in many prior test launches, there are significant socio-ecological implications. Besides a nearly indefensible waste of a car at a time of rampant global inequality and challenges of sustainability (Robinson, 2018), the addition of

objects into outer space underlines the fact there is already quite a lot of stuff out there, in particular in orbits close to the Earth. While the functional objects are creating an “environment” which provides referential interaction back to Earth through service like remote sensing and limited biological habitation (chiefly on the International Space Station and similar habitats), the discarded material is increasingly seen as a threat. Due to high energy motion of these objects and their uncontrollability, they are at risk of colliding and extensively damaging the “useful” artefacts, as well as potentially scattering debris that further endangers others. This is described as Kessler Syndrome – an exponential effect that could create a massive field of debris, making traversing certain orbits extremely risky and thus effectively halting our ecological expansion anywhere into outer space.

It seems the danger of human-introduced “space junk” could be potentially placing an existential constraint on our liberty to pursue the expansion of our ecosystem. Or alternatively, we our desire for ecological expansion places a constraint on our liberty to produce more space waste. Either way, even in the purely material and technological expansion of the ecosystem (without living organisms being involved directly in the in-situ interaction) is a challenge to the framework of (absolute) liberty. Hence, it seems likely that with further development of various communes and communities in outer space, a techno-ecological perspective will be the reference frame for their organisation – whether their protagonists want it or not!

4. Towards “Techno-ecology”

Once the frame of analysis of the ecosystemic expansion into outer space shifts towards a combination of technological and ecological considerations, a wider array of concepts becomes available to understand its relationship to individual and communal liberty. Of crucial importance are the relationship between communal criticality of the environmental co-dependence and the individual’s ability for decision making. A techno-ecological perspective also allows for understanding how any of the emerging outer space communes – since these societies are primarily though to be self-referential – interact with the existing ecosystem on Earth, including its social structures. Ultimately, the techno-ecology is a way to re-imagine constraints and affordances of the off-Earth environments and allows for both recognition of ways in which ecological considerations limit liberty in situ, as well as how they allow for (partial) liberation from existing/past governance frameworks.

As outlined right at the beginning, the most fundamental ecological principle is the intrinsic between living organisms and their environment. One critical consideration for expanding terrestrial life into outer space is then the structure and the affordance of the new environment. For instance, anthropological studies have been looking at “waste” as “matter out of place” (Douglas, 1966) – a relational perspective that enables the understanding that “waste” is a mater of context and can be re-evaluated as non-waste. Hence, “space waste” could also be seen as a “space resource” – tonnes of metal, silicates, etc., which can be repurposed for future missions and projects. The recognition that shifting our (social) perspective on resources and functions of materials and artefacts can lead to a certain amount of independence from the originating ecosystem allows to start the process of ecosystemic (re)configuration within/of the new environment.

Conversely, an ecological perspective on life on the surface of Mars or at an Asgardian “space arc” needs to take into consideration the context of the in situ social relationships. Of particular concern here is that it is the ecological interdependence which frames the critical fragility of life’s existence beyond established ecosystemic boundaries. When moving to a techno-ecology, the technological intervention which enables the much more limited ecosystem to (continue) to exist in an otherwise hostile environment becomes the governing force within such an ecosystem. In addition, if the technology itself is somehow dependant on the physical and/or social affordances of the originating

ecosystem (i.e. the Earth), that is a particularly acute limitation. That liberty under such circumstances will be severely limited goes without saying – the question is for how long? Is independence (or more crucially, self-sustainability) ever possible? In spite of the optimistic sociotechnical imaginaries of thriving independent civilisations in outer space, the future is uncertain. It is possible that eventual emancipation is achievable, however with its pursuit, the early settlers are condemned to a long period of severely limited liberty. Is that process sustainable or will it lead to (self)destruction of the community. Even if the society survives, its initial of deprivation of self-governance may leave it incapable of envisioning, let alone enacting, any libertarian ideals currently put forward.

The bottom line of this experimental exploration of the interplay between ecology and liberty is that they are indeed in conflict when extending the ecosystemic framework. On one hand, past ecological constraints and affordances have shaped our systems of thought and governance in a way that frames liberty as a function of our ecosystem. Since as reach out to space is an extension (and not the establishment) of the ecosystemic framework, we are projecting our past/current perspectives into the new/imaginary as well. This is exacerbated when a techno-ecological reality dictates that a strong referential dependency remains in place. On the other hand, as the ecosystemic framework is stretched, a more systemic reevaluation of the existing social relationships occur. This has been mentioned previously in the context of SpaceX's disruption to the satellite and human spaceflight market without direct reference to the grander vision to settle on Mars. Therein lies perhaps a glimmer of hope that techno-ecology is not antithesis to liberty – as the pursuit of the ecosystemic expansion may once realised have shaken up the entire (new) governance framework, both at the origin (i.e. on Earth) as well as in the expanse (i.e. outer space).

Hence, a degree of techno-eco optimism is perhaps not unwarranted, though extreme caution should be advised. Historiographical studies of past colonisations clearly show that the application of past governance frameworks to expanses of (the Western) social sphere on earth caused untold suffering. The adoption of “business-as-usual” attitude or dismissal of ecological constraints as “teething problems” does not bode well. Similarly problematic is replicating everyday metaphors – such as cleaning outer space of space junk – or social structures like “constitutional monarchy”. While these may or may not survive the contact with the real techno-ecology of the outer space, the damage they can do in the process of attempted application may make it unviable for any real sense of liberty to emerge. As such, ecology is not antithesis to liberty, but a biotop to its biocenosis – neither can exist without the other and they are mutually interdependent.

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