



ASTROSOCIOLOGICAL INSIGHTS FORUM

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WHY SHOULD I SUPPORT ASTROSOCIOLOGY?



NOTES FROM THE CEO

The question raised when announcing the topic of this issue of *Astrosociological Insights* was quite simple. Why should I support astrosociology?¹ Copies of the Call for Articles went out to social and behavior scientists, humanities scholars, and artists – as one would expect – but they also went out to physical and natural scientists including all types of STEM-related professionals and students. Many of the latter individuals mentioned to me that they did not know much about the social-scientific approach, but they were intrigued to find out more. I responded that this was a “thought exercise” in which they should imagine how the social sciences could impact their work and space exploration, settlement, and other related topics. Many of them decided to participate, as you will see in the articles that follow. The Astrosociology Research Institute (ARI) has come a long way thanks to the participation of supporters such as those who contribute to this particular issue, previous issues, and those that will follow.



DR. JIM PASS

FOUNDER OF ASTROSOCIOLOGY &
THE ASTROSOCIOLOGY
RESEARCH INSTITUTE

As a growing number of individuals already know, astrosociology is the study of astrosocial phenomena (e.g., the social, cultural, and behavioral patterns related to outer space). The focus on the human dimension of space exploration and its various derivatives is vital for the future because it complements the STEM fields and disciplines that include the physical and natural sciences, technology, engineering, and mathematics. The growth of support is in large part due to the continuing work involved in explaining why a dedicated focus on the human dimension is essential for the future of humankind as plans are already being made for humans to venture farther away from Earth as well as due to the fact that space itself will increasingly affect terrestrial societies in significant ways that will continue to produce substantial social change. Relative inaction by social scientists places future increased space activities in dangers that should be avoided.

In this light, I founded astrosociology publicly in 2004 due to the void in space education and research.² This void refers to the extremely low numbers of social and behavioral scientists,

[1] Note: putting this issue together has taken quite a long time due to the Covid-19 pandemic, an early shortage of submissions, and then a great surge of articles much later. Nevertheless, the wait is well worth it because the quality and quantity of the articles exceeded our expectations. Thus, we are quite certain that you will be impressed by this issue!

[2] Pass, Jim (2006). “The Potential of Sociology in the Space Age: Developing Astrosociology to Fill an Extraordinary Void.” Pacific Sociological Association (PSA) Conference in Universal City, CA, as part of the Sociology of Science and Technology session. URL:

<http://www.astrosociology.org/Library/PDF/submissions/Potential%20of%20Astrosociology.pdf>

humanities scholars, and artists – not to mention students – participating in space-related research and educational activities. Several questions arise based on this void. How could a student study, and even discover astrosociology, when there are no professors, teachers, mentors, and classmates working on astrosociological problems or researching astrosociological issues? How can humans live in space ecosystems sustainably without instilling the social, cultural, and behavioral lessons learned in countless terrestrial groups and societies? These types of questions point to the fact that the human dimension of space exploration remains largely unexplored at an ongoing cost.

Relatedly, I termed this inadequacy in academia as the Astrosociological Frontier.³ This relative absence in studying astrosocial phenomena refers to the lack of timeliness of social scientific input into studying these astrosociological issues; namely, the postponement of serious scholarly attention to space issues that have put the social sciences far behind the physical and natural sciences. The void characterized by the inadequately of how much attention is paid to how societies are affected by space activities is rooted in academia's indifference to outer space. There is a lack of social-scientific education and research in this area while the impact of space exploration has continually affected social systems and people since the dawn of the space age with the launch of the Sputnik 1 satellite on October 4, 1957. While it is true that historians have played a great part in relating the events that transpired, social scientists have largely failed to add to their work.

Thus, the main problem is not that no social scientists studied space issues. Rather, the problem refers to the shortage of social scientists doing so compared to what is now termed those involved in the STEM disciplines and fields. For example, an early-stage mentor of mine was the late and great Dr. Albert A. Harrison, a social psychologist who had a substantial impact on space education and research as well as on the early success of the Astrosociology Research Institute.⁴ He taught at the University of California, Davis and worked with NASA in addition to several other organizations such as the SETI Institute. In fact, he was the first advisor for ARI in 2005, one year after I founded this academic field and its initial definition of astrosociology. For anyone interested in understanding the important aspects of the human dimension, I strongly suggest that they read his works, especially his book called *Spacefaring: The Human Dimension*.⁵

[3] Pass, Jim (2009). "Pioneers on the Astrosociological Frontier: Introduction to the First Symposium on Astrosociology." Space, Propulsion & Energy Sciences International Forum (SPESIF). American Institute of Physics. URL: http://www.astrosociology.org/Library/PDF/Pass2009_Frontier_SPESIF2009.pdf.

[4] See my tribute to Dr. Harrison in my AIAA conference paper called "Albert A. Harrison: Outer Space, The Human Dimension, and Astrosociology": <http://www.astrosociology.org/Library/PDF/Space2016-JPass-AlbertAHarrison.pdf>.

For a list of Dr. Harrison's work that relates to space exploration, see the following page at <http://www.astrosociology.org/AAH-InMemoriam.html>.

[5] Harrison, Albert A. (2001). *Spacefaring: The Human Dimension*. University of California Press.

ARI's "Astrosociology in the Classroom" program now includes a program that involves high school and middle school students.⁶ As it turns out, putting this program into motion has brought in a growing number of high schools inquiring about astrosociology as a complementary approach to the study of space issues. And most recently, it has come to my attention that middle school students may well become involved as well. See Bob Barboza's article in this issue that discusses the Barboza Space Center and ARI's joint venture in this new astrosociological landscape that expands from a single focus on the post-secondary education to the lower levels of education. This is important because this approach can create a pipeline that feeds colleges and universities with students interested in pursuing astrosociology as careers in both branches of science (that is, the physical and social approaches to the study of outer space and its relationship to humankind).

From the very beginning when I founded astrosociology, it was always my goal to unite the astrosociology with the STEM disciplines and fields; that is, uniting the physical and the social approaches known in early astrosociology circles as The Great Divide.⁷ Only with a growing interaction between the two branches can societies on Earth and eventually beyond benefit most extensively. This notion is important because it certainly seems as though astrosociology has surpassed a tipping point in history characterized by the fact that amazing things are already happening. So, why should you support astrosociology? Because it exists, it is increasing in its impact, and it will add the human dimension to the important work traditionally worked on by those in the traditional space sector. Another important reason to development astrosociology is to also develop the corresponding community of students, educators, practitioners, and scientists who can interact and therefore move the astrosociology field forward at an accelerated pace.



[6] Pass, Jim (2021). "Expanding the Scope of Astrosociology in Order to Settle Mars: An Essay." 24th Annual International Mars Society Convention. URL: <http://www.astrosociology.org/Library/PDF/ExpandingAstrosociologytoSettleMars2.pdf>.

[7] Dudley-Rowley, Marilyn (2004). "The Great Divide: Sociology and Aerospace. California Sociological Association (CSA) Conference. URL: http://www.astrosociology.org/Library/PDF/submissions/The%20Great%20Divide_CSA2004.pdf.

In this light, please enjoy this issue and enlighten yourself to more details about astrosociology and the general importance of social-scientific education and research, which will expand into more specific areas of research! This issue touches on several of the underlying reasons why social science cannot remain undervalued as humankind moves forward into space. The unique perspectives by these authors provide important underlying reasons for the continued development of astrosociology.



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FROM THE EDITOR

As we look towards the stars and envision humanity's future in space, the importance of understanding the human dimension of this journey becomes clear. This issue of *Astrosociological Insights* centers around a question that is as profound as it is timely: "Why should I support astrosociology?" The articles in this edition aim to answer this question by illustrating how astrosociology touches and enriches all fields of science, making it an essential area of study for anyone concerned with the future of humanity in space.

Astrosociology is unique in that it intersects with a vast array of scientific disciplines, offering insights that extend beyond the traditional boundaries of space exploration. While the physical and natural sciences—such as astronomy, physics, and engineering—focus on the technical and material aspects of space, astrosociology brings in the crucial element of human experience. It challenges us to consider how space activities affect our societies, cultures, and behaviors, and how, in turn, our social structures and cultural values influence our approach to space exploration.

To complement and highlight the multifaceted discipline of astrosociology, the articles featured in this edition represent a rich tapestry of thought and expertise, showcasing how astrosociology intersects with various disciplines and areas of study. From art to philosophy, law to astronautics, these contributions underscore why it is a field that deserves attention and support. The articles presented here highlight the importance of integrating social-scientific research into the broader field of space exploration. As the impact of space activities on terrestrial societies continues to grow, the insights offered by astrosociology will become increasingly essential in addressing the social, cultural, and ethical challenges that lie ahead.

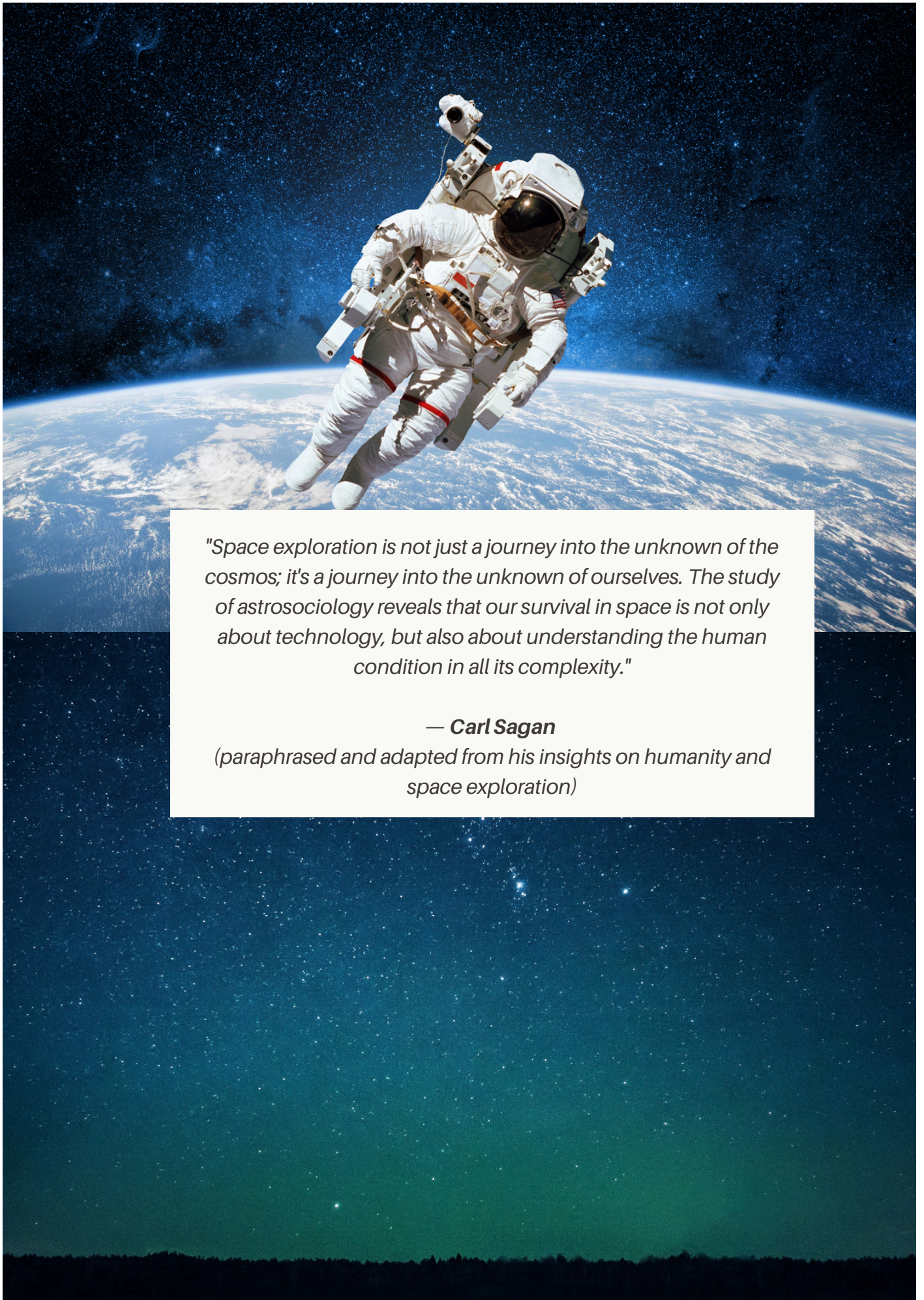


I encourage you to read through these insightful contributions and reflect on how astrosociology can enhance your own understanding of space and its impact on our world. By supporting astrosociology, you are supporting a future in which space exploration benefits all of humanity—both on Earth and beyond.

Mia Belle Frothingham
EDITOR IN CHIEF

**ASTROBIOLOGIST & SCIENCE
COMMUNICATOR**

**PHD STUDENT AT THE UNIVERSITY OF
EDINBURGH**

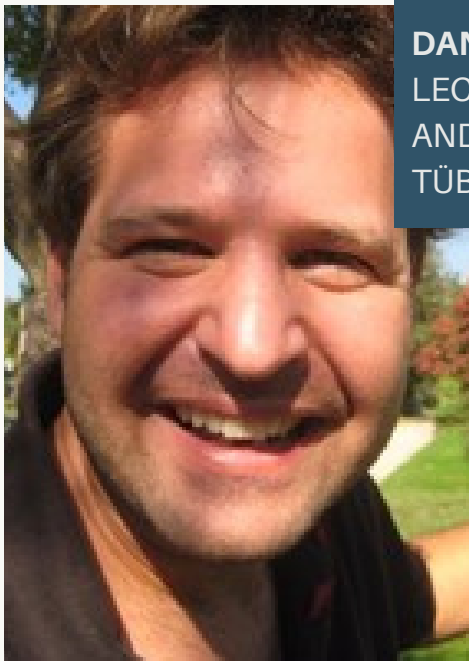


"Space exploration is not just a journey into the unknown of the cosmos; it's a journey into the unknown of ourselves. The study of astrosociology reveals that our survival in space is not only about technology, but also about understanding the human condition in all its complexity."

— Carl Sagan

(paraphrased and adapted from his insights on humanity and space exploration)

WHY I SUPPORT ASTROSOCIOLOGY



DAN CORJESCU

LECTURER IN GLOBALIZATION, SOCIETY AND TECHNOLOGY,
AND ENVIRONMENTAL ETHICS AT THE UNIVERSITY OF
TÜBINGEN

Aristotle's *Metaphysics* famously begins with the assertion that "All men by nature desire to know". While that may not have been true in all times and in all places, it is definitely a driving psychological force underpinning our current technical-scientific civilization.

One of the great projects of our civilization has been our gradual expansion into and habitation of space. We want to know more about space and eventually live in it. Of course, we just don't want to exist in space, we, presumably, want to thrive in it. For this, much more will be needed than just the "nuts and bolts" of physics, engineering, and chemistry. In order for the human species to live well and to flourish anywhere, including space, the knowledge, wisdom, and perspectives of the social sciences and humanities is crucial. For science can get us into space, but it cannot tell us what to do there, how to live, and what activities to value.

Thus, for the well-being of the total future human in space a corresponding intellectual discipline is necessary. Such a discipline could be something very much like Astrosociology. A complex intellectual integration of history, philosophy, sociology, and the arts with the "harder sciences" of math, physics, and engineering. For as the cult German film *Metropolis* reminded us "between the head and the hands must be the heart!"

So while the hard sciences make up the "head and the hands" of Astrosociology, the social sciences and the humanities constitute its heart. For science, can never be allowed to progress without the wisdom of the heart as represented by normative, ethical, and artistic questioning and imagination. Because it is not enough for the human species to live in outer space, it must as Aristotle would have said "live well" in its new environment. It must ask the hard questions of what it means to flourish and be happy on new planets and artificial space stations. For to live in space, will surely require new ways of being, thinking, and doing. All of which represent a challenge to the collective wisdom of mankind.

Indeed, our epic voyage into space presents an intellectual opportunity just as great for the humanities and the social sciences as for the general sciences. For the mirror of space will allow us to look at ourselves in new ways while affording us new paths of becoming and being undreamt of by past generations. It will most likely entail issues concerning genetic engineering, nanotechnology, AI and robotics that will intersect and reconfigure our notions of what is human and what should become human and, maybe, what eventually will transcend it. Thus our voyage into space is but the next stage of our voyage into what it means to be human.

THE LOST CONTINENT OF LEMURIA, NEANDERTHAL URGES AND THE RATIONALE FOR SPACE EXPLORATION



ALICE GORMAN

RECOGNISED LEADER IN THE FIELD OF SPACE
ARCHAEOLOGY AND ASSOCIATE PROFESSOR AT FLINDERS
UNIVERSITY, SOUTH AUSTRALIA

If we take astrosociology to include the broad suite of disciplines which investigates human behaviour through time and space, informed by social theory, then archaeology falls within this purview. The archaeology of outer space has been developing as a distinct field of study over the last 20 years.

I became a space archaeologist after a more conventional archaeological career. My PhD research investigated evidence for symbolic behaviour in the Palaeolithic period, from three million years ago to about 40,000 years ago, through the very symbolic activity of body modification.¹ Symbolic behaviour is part of a suite of characteristics called 'behavioural modernity' - essentially what makes ancient anatomically modern *Homo sapiens* human and provides continuity with humans today. The archaeological question was how and when these attributes emerged.

It was unexpected to find that my previous research had relevance for the archaeology of space. I quickly became aware of a very pervasive trope in the space world: the idea that there was an innate human imperative to explore, the reason why humanity had to 'conquer' space and extend its footprint beyond the 'final frontier'. This was frequently accepted unquestioningly by my aerospace colleagues but didn't sit easy with me. I found, when I disputed it, that people would respond with a consistent set of counter-examples: the migration of *Homo sapiens* out of Africa, the colonisation of the Pacific islands by Austronesian speakers from around 3,000 years ago, and the 15th century 'explorers' who found the 'New World' and founded the European empires. People tended to be deeply attached to this story, perhaps because they could relate it to their personal contribution to space.

This thinking assumes the desire to explore is part of behavioural modernity. It links into what I came to call the Space Race model, a framework used to interpret the causes and changes of space technology over time.² The Space Race model

[1] Gorman, A.C. 2001 The archaeology of body modification. The identification of symbolic behaviour through usewear and residues on flaked stone tools. PhD thesis, University of New England

[2] Gorman, A.C. 2005 The cultural landscape of interplanetary space. *Journal of Social Archaeology* 5(1):85-107

...emphasises competitiveness rather than cooperation in space, and overlooks the contributions of and impacts on non-spacefaring countries, like the colonial territories where potentially dangerous space installations were located. The relationship of space exploration to inequalities between the developed and developing world is unexplored, and indeed unproblematic, in the Space Race scenario, where US hegemony in space is assumed to benefit all.³

Even now, the so-called 'space barons' (like Elon Musk and Jeff Bezos) and their disciples use the human imperative to explore as a rationale for the commercialisation and privatisation of outer space. The space barons are seen by some as a kind of quintessential human who pursue this evolutionary imperative on behalf of all humanity.

However, the Space Race was not just about Cold War competition to be the first in orbit and then on the Moon. There is a story of ethnic 'race' concealed beneath its familiar elements, which dates back to 19th century theories of the dispersal of human 'races' across the world. Europeans were baffled by the diversity of human cultures that the colonial process had revealed, and scientists in disciplines which didn't quite exist yet – like anthropology and sociology – were unable to agree on how different types of human body and society fitted together. They fell into roughly two groups.

The monogenists, such as Armand de Quatrefages de Bréau, argued that all humans had a common ancestor, and hence must have migrated from a common homeland to all corners of the globe. The polygenists argued that different 'races' arose in the places where they were currently living, and were adapted to the climate and environment of that location. Hence, large portions of humanity were not related to each other.

The adherents of both schools of thought clashed over an apparent puzzle: the perceived similarities between three populations generally held to be at the bottom of the evolutionary ladder, the most 'primitive' people on Earth. These were the dark-skinned inhabitants of Papua New Guinea, the Negrito people of the Andaman Islands (off the coast of India), and the Tasmanians. All followed a 'hunter-gatherer' lifestyle, used stone tools, and practiced a form of body modification called scarification which was held, at the time, to be an early form of tattoo.

The monogenists proposed that all three were the descendants of migrating populations who had never evolved beyond the primitive stage. However, none of these groups were known to have watercraft capable of seafaring at the time Europeans encountered them. The polygenist Josiah Nott argued that these populations had no 'tendency to migrate', regarding this as a racial characteristic that some humans possessed – just not these ones.⁴

[3] Gorman, A.C. 2005 The archaeology of orbital space. In Antonnette Joseph (ed), Proceedings of the Australian Space Science Conference 2005, pp 338–357. Melbourne: RMIT University.

[4] Gorman, A.C. 2008 The primitive body and colonial administration: Henry Ling Roth's approach to body modification. In R. McDougall and I. Davidson (eds), The Roth Family, Anthropology and Colonial Administration. Walnut Creek: Left Coast Press, pp.83–103

Papua New Guinea and the Andaman Islands were located in tropical environments while Tasmania was cold. Moreover, they were separated by vast areas of ocean. Rather than concede that they had travelled widely across the Asia-Pacific, the polygenist school resorted to the mythical continent of Lemuria to explain the distribution of these cultures which seemed so similar. According to this theory, when Lemuria sank beneath the sea, dark-skinned people of short stature were isolated on islands at the edges of the former continent in the pattern observed at the time of European colonisation.⁵

Polygenist theory did not allow that apparently 'primitive' groups shared characteristics with the white, Christian European men who took the globe as their birthright ordained by God. My reason for relating this old debate is to show how contested the idea of exploration or migration as a natural human tendency has been, and how it relates to now-discredited ideas of 'race'. It wasn't until the work of Franz Boas in the first half of the 20th century that human cultures came to be regarded as internally coherent, rather than representing steps on an evolutionary ladder.

Paradoxically, in the master narrative of the 'human urge to explore' as expounded by proponents of the Space Race model, the idea that some groups of people have fewer urges than others is implicit. The white Christian male is still a representative of humanity, carrying a new 'white man's burden' to represent the lesser non-spacefarers in the rest of the solar system. The division of the world into 'space-faring' and 'non-spacefaring' nations is not so far from the monogenist perspective which assessed some groups of people to be arrested in an older evolutionary phase. It also shares features with the polygenist view, where some humans simply lacked a migratory instinct.

To justify the exclusion of the 'non-spacefaring', the Space Race model treats humanity as if it were an isotropic whole, which can be represented by any part. In the last twenty years, however, archaeological research has turned what we thought we knew about anatomically modern humans and the path to behavioural modernity on its head. New Homo species such as Homo floresiensis (known as the Hobbit), and the Denisovans have come to light. Neanderthal people were once thought to be an evolutionary dead end, and a thousand illustrations depicting them with shaggy, ungroomed hair were meant to signify their 'primitive' nature. They have been shown more and more to possess cultural features once reserved for Homo sapiens and have been rehabilitated as our ancestors. What if the 'urge to explore' was part of our Neandethal heritage?

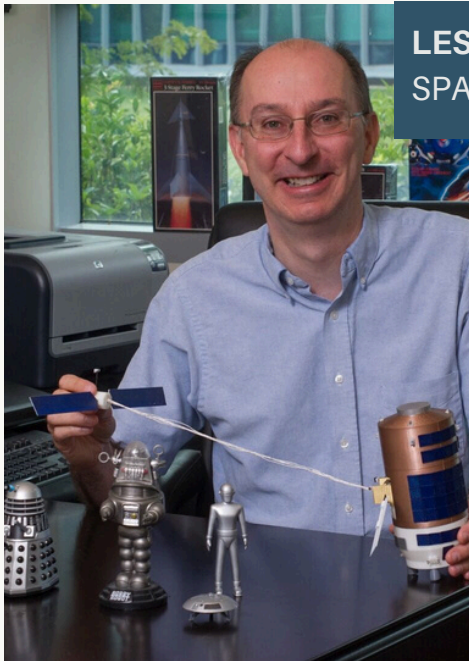
Even the concept of 'humanity' cannot be taken at face value. While the notion of a unified human nature underpins human rights, it is not without problems. A singular human nature of the kind described by behavioural modernity becomes a sort of mystical essence akin to the soul, separate from the historical conditions which shape technology and society. Eliding the colonialist origins of terrestrial inequality under the banner of 'humanity' is not a position which facilitates the elimination of inequalities in future space societies.

[5] Falkinder, J.S. 1931 The extinct Tasmanians Part III. Mankind 1-3: 69

I can't pretend to see a clear path through the twists and turns of understanding what it even means to be human. I just know that stories matter, both at the level of the individual and broader society. What kind of stories will we tell about humans and the past in the future, perhaps when people are living on the Moon and Mars? As the push towards making humans a multi-planet species accelerates, it's no time to cling to outdated theories from two centuries ago. This is why astrosociological insights are so necessary, here and now.



A PERSONAL VIEW OF THE INFLUENCE OF THE ARTS AND HUMANITIES ON SPACE EXPLORATION



LES JOHNSON

SPACE PROPULSION TECHNOLOGIST AND AUTHOR

It is difficult to imagine space science, exploration, development, and eventually settlement solely in the context of the engineering and technical, yet that is the philosophical presupposition held by many when examining the field from the outside – but is it true?

Since the 1950s, the public faces of space exploration have been the scientists and engineers. From Willey Ley to Von Braun, to Carl Sagan and Neal deGrasse Tyson, and Sally Ride to Ellen Stofan, the media constantly portrays those working in the space field as being more comfortable with math than than words and hardware over people. While there is undoubtedly a basis for this perception, what the public sees is merely the outer layer of a much more complicated onion filled with people with backgrounds more in common with astrosociology than astronomy and physics.

Willey Ley and Werner Von Braun did not enter living rooms across the world on their own. They were brought there by the media. Most notably, they were actively promoted by Colliers Magazine and Walt Disney. Beginning in March 1952 and continuing through April 1954, Colliers Magazine (one of the most popular magazines in the USA at the time) ran a series of articles on the future of space exploration, taking the technical ideas of the era's space visionaries and making them interesting and understandable to a more general audience. With breathtaking artwork provided by Chesley Bonestell, Fred Freeman, and Rolf Klep, Americans began their journeys into space from the comfort of their favorite easy chairs. Yes, the technical genius of the engineers was at the core of what was presented, but had it not been for those skilled in the humanities, the impact on American society would have been minimal.



Figure 1. Colliers articles on space exploration supported the transformation of American culture to one supportive of space travel.

Walt Disney, who owned American living rooms due to the immense popularity of his Wonderful World of Walt Disney television show, brought even more of the general populace along for the ride into space with his "Man In Space" series. And that was just the beginning. It is not a stretch to imagine a world without a lunar landing in the 1960s had these two media behemoths not prepared the culture for John F. Kennedy's challenge to land a man on the moon before 1970.

Fast forward to modern times and one can readily see the same forces at work. To illustrate, I would like to provide an example of the influence of the arts and culture on none other than NASA.

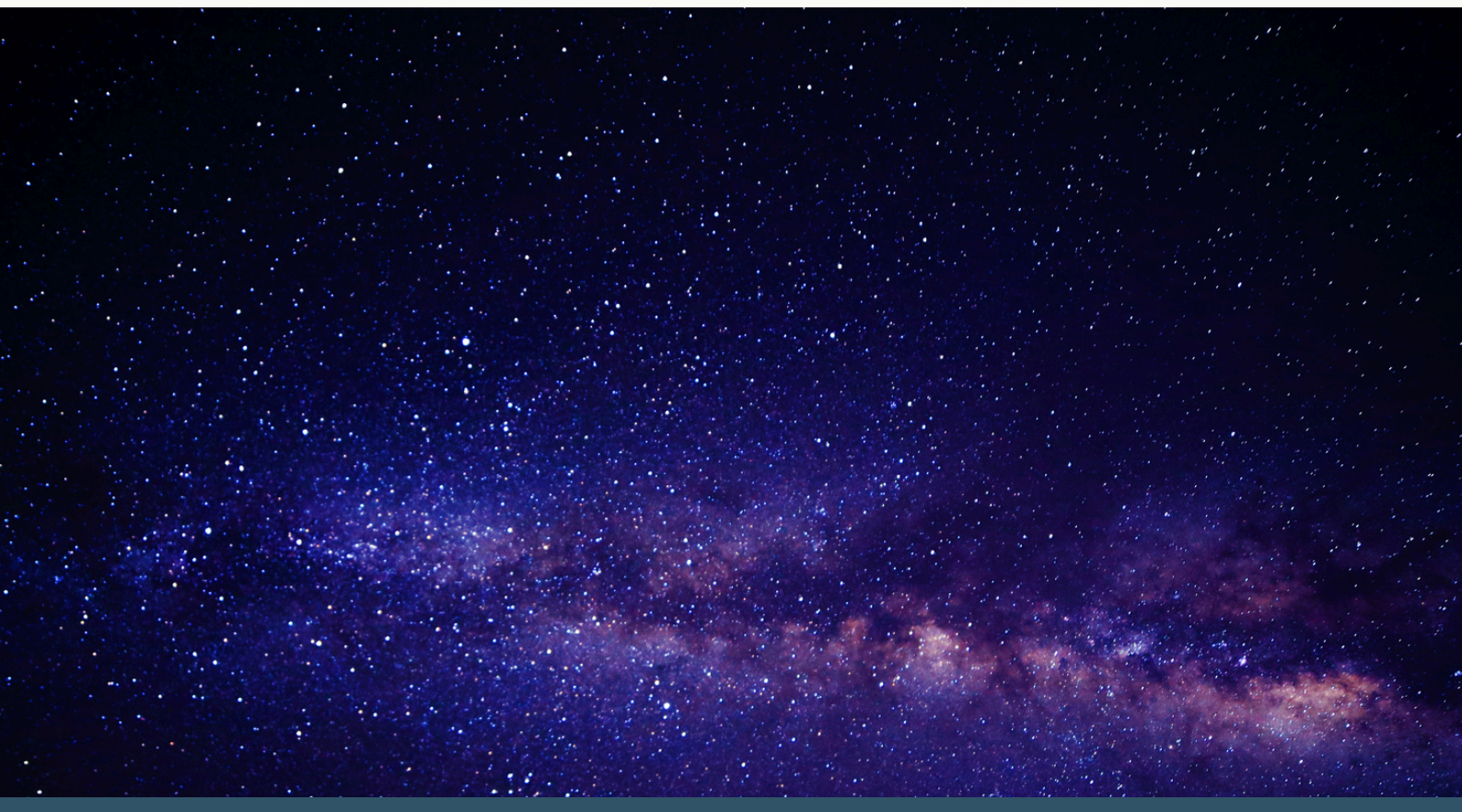
Early in the last decade, NASA wanted to learn more about what inspired its workforce to choose careers in science and engineering. They commissioned a study to identify innovators from around NASA, interview them, and find out what motivated them to choose their careers and, ultimately, to contribute to the nation's space program. I was honored to be among the few (of about thirty from a workforce in the thousands) nominated to participate. The assessment included interviews, questionnaires, background surveys, and a workshop at NASA Headquarters in Washington. During the workshop, the firm performing the assessment provided a demographic breakdown of those who participated and were in the room. It contained the usual breakdowns of age, education level, ethnicity, etc. At the end of their summary presentation, they showed a cloud chart with the words they noticed we, as a group of individuals, used in describing what motivated us to study science. (A cloud chart shows data, in this case words, that are used most frequently, with the font size proportional to the frequency with which a particular word is used. The more a word is used, the larger the font size.) The chart was filled with what one might expect: "inspiration," "exploration," "science," "Hubble Space Telescope" and a smattering of others. In the middle there was a large blank space that took up about 1/3 of the page. The speaker kept the audience in suspense by telling us that there were two words that were mentioned by nearly everyone as being a motivating factor in our decisions to study science and engineering. Two words that were mentioned far more times than any other. What were those two words?

Star Trek™

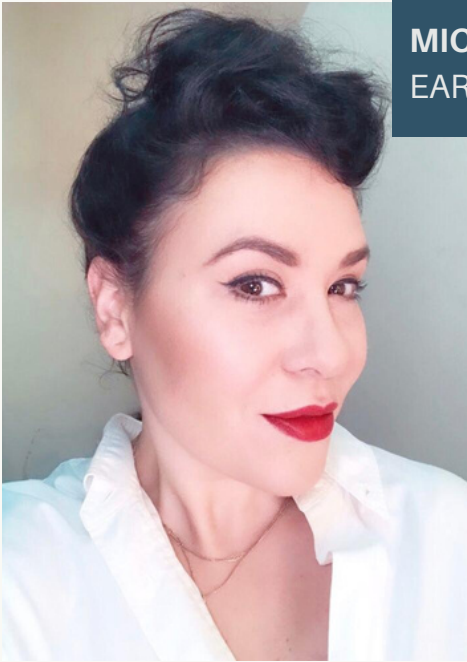
Looking around the room, and in the conversation that followed, it was apparent that no single series was responsible. For many of us, it was the original series and The Next Generation. For others it was Deep Space Nine and Voyager. For the younger among us, the deal was sealed with the Chris Pine original series film reboot. For me, Star Trek, combined with the amazing fiction by Robert Heinlein, Stephen Baxter, and the incomparable duo of Larry Niven and Jerry Pournelle were clearly responsible for my choosing to study physics and to work for NASA.



As we work on the technologies and systems that take us into space, we should remember that it is the culture that ultimately enables the journey. Scientists and engineers cannot take us to the stars without the artists, writers, philosophers, attorneys, accountants, and business managers also sharing the dream and, in many cases, creating it.



ASTROSOCIOLOGY AND SPACE ARCHITECTURE



MICHAL ZISO
EARTH & SPACE ARCHITECT

"Nothing good lasts forever, and Earth is no different - if we want to survive we need to find alternatives. Humans survive, but the burning question is when will we stop focusing on how to survive in space, how to basically not die, and start focusing on how to LIVE in space. The future of humankind has to prosper, not just survive".¹

Space is hard. It is hard to get there, it is hard to build there, to live there and also hard to come back from. Up until now the focus was to explore, to learn, to discover. To be able to bring up satellites, telescopes and humans; to reach space and come back alive. Today, as we are living in the New-Space Era, our goal as humanity has changed - we are now looking to become interplanetary or space faring species as well as opening up Space for more people, including tourists, as flight costs gradually decrease. Up until now we were focused on the urgent due to limited resources in space where functionality always comes before aesthetics, almost completely ignoring the benefits of a designed environment on our mental state and wellbeing.

It is clearer now than ever that we must take astrosociology into consideration, however we should have been implementing ideas derived from it from day one. As an architect practicing for the past decade around the world, I understand that our environment affects the way we behave, think and feel. That means that the way our environment is designed has an impact on our efficiency, safety, comfort and our level of enjoyment. Even though the ISS was designed almost 40 years ago, and in the past 21 years has been the home for astronauts, one of the very few things that were designed with the astronauts enjoyments and wellbeing in mind, is the Cupola² (a dome like observational module) which was installed only in 2010, 11 years ago. It was conceived as a way for astronauts to see and control the station arm or to watch spacewalks but it is also providing a tremendous vantage point for watching the Earth and a relaxing solace from the hectic schedule on station.

Our world is changing exponentially and architecture is rarely keeping up. Earth's built infrastructure was designed in times of a completely different social structure, by a rather

[1] Ziso, Michal, "The Surprising things I learnt on my journey to become a Space Architect"; TEDxISU International Space University, Strasbourg, France, 2019. <https://youtu.be/mclRpweCu3s>

[2] Cupola Observational Module, NASA: https://www.nasa.gov/mission_pages/station/structure/elements/cupola.html

homogenous group of professionals which may have reflected the privileged for whom the built environment was designed for. However, as times change we are left with not only physical architecture but cognitive fixations that affect what and how we approach design, causing our very diverse societies around the world to suffer from “discrimination by design”. We tend to overlook design flaws, accept them as a given and not question if our lives could improve if it was designed differently - with diversity of users in mind. Since it usually takes years to design and construct architectural projects, even when the design was thought out as fitting to a current reality, we frequently find that by the time the project is completed, the location within which it is built has changed since the original reality of conception. Until not long ago designing for averages was the acceptable approach - an average human with an average built and average background, more often than not this average was also male. Only recently, personalisation caught center stage, defining user experience and journey is one of the first things any good startup company tries to nail down, yet this approach today is still infrequent in architecture.

When we think about designing in space, the gap between the rapidness of change (technology, identity of users, goals etc.) and the pace of which the architecture is updated is considerably deeper. Let’s take the ISS again as an example - it was designed in time when astronauts were predominantly male and white; for reference only in 1983, Sally Ride³ became the first female American astronaut (and the third woman in space overall after USSR cosmonauts Valentina Tereshkova, 1963, and Svetlana Savitskaya, 1982) and Guion Bluford⁴ became the first African American Astronaut (and the second of African descent after Cuban cosmonaut Arnaldo Tamayo Méndez in 1980). Only in 2020 a space toilet fit for the female anatomy⁵ was sent up to the ISS (along with other space toilet upgrades). The ISS is a magnificent manifestation of engineering and ingenuity yet it was designed in a different time (in terms of knowledge, technology, habits and social norms) for survival and maximum functionality without enough consideration of the physical and mental comfort of its users, not necessarily acknowledging that a designed environment can actually contribute to the astronauts’ efficiency.

Democratizing access to space calls for designing for diversity which means taking into account not only the gender, body proportion and race, but also age, cultural background, behavioral patterns and social habits. Whether it is on the ISS or habitats on the Moon or Mars, we are designing and formulating structures as close-loop system environments as compact as possible to lower costs and facilitate management and control of the habitat’s conditions. If we want our astronauts, space tourists and travellers to be diverse, we must remember that when having them together in minimal physical environments, each of them will have different perceptions of comfortable personal space, of acceptable social interactions and group dynamics.

[3] Sally Ride, the first American woman to fly to space; biographical data. NASA; [5] Falkinder, J.S. 1931 The extinct Tasmanians Part III. Mankind 1-3: 69

[4] Guion Bluford, biographical data. NASA; [5] Falkinder, J.S. 1931 The extinct Tasmanians Part III. Mankind 1-3: 69

[5] Oberhous, Daniel. “Why NASA Designed a New \$23M Space Toilet, WIRED Magazine” 2020; [5] Falkinder, J.S. 1931 The extinct Tasmanians Part III. Mankind 1-3: 69

If we want to ensure their well being we have to understand their individual journeys and exercise human-centred design, therefore astrosociology is not only important but a crucial factor in the design process. It is not “nice to have” but rather imperative to the thriving of humanity in space just as much, if not even more, as it is on earth due to the added extreme conditions and the physical and mental impacts of this high-risk, astounding existence.



SHOULD CRIMINOLOGISTS BE CONCERNED WITH OUTER SPACE? A PROPOSAL FOR AN 'ASTRO-CRIMINOLOGY'



JACK LAMPKIN

LECTURER IN POLICING, LEEDS TRINITY UNIVERSITY

In this article we make a basic case for the establishment of an 'astro-criminology' - in response to the escalating levels of human activity in outer space, an area which so far has largely escaped criminological scrutiny. We hope that this piece will act as a starting point for ourselves - and others - to develop research and theory into human endeavours in this area. A seminal aim is to identify (and propose solutions to) criminal behaviours and social harms in outer space, and those associated with the space industry. In this article we will justify why there should be an 'astro-criminology' and we will provide a definition to set out the parameters of the subject area.

We will also afford an insight into important early work in astro-green criminology which has preceded discussions of an 'astro-criminology.' During the early days, space exploration was largely dominated by a handful of powerful state actors - and hence much of the founding debate around any drawbacks of this activity focused on potential environmental impacts. It is only in recent years that the surge in the number and range of actors, both non-state and state, has highlighted the potential for serious harms beyond environmental concerns.

Astro-green criminology has progressed to examine an array of imminent environmental issues associated with human relationships with outer space, including: space debris in Low Earth Orbit (LEO); the proposed mining of extraterrestrial bodies; the protection of space heritage sites; on-Earth emissions pollutions; and the emergence of powerful multi-national corporations resulting in concerns around space capitalism.^{1,2} To begin, however, we will attempt to justify the development of - and necessity for - an 'astro-criminology.'

Criminologists have studied wrongdoing and lawbreaking for at least the previous three centuries. The earliest traces of 'criminology' are often associated with the enlightenment era (18th century) with early classical and positivist thinkers Beccaria, Bentham, Mill and Lombroso.³ These key figures were not, however, the first to think about, theorise and research, crime within society.

[1] Lampkin, J.A. (2020) Mapping the Terrain of an Astro-Green Criminology: A Case for Extending the Green Criminological Lens Outside of Planet Earth.

[2] Takemura, N. (2019) 'Astro-Green Criminology: A New Perspective Against Space Capitalism Outer Space Mining may make the Same Mistakes in Space as we have on Earth,' Toin University of Yokohama Research Bulletin, 40: 7-17.

[3] Carrabine, E. Cox, A. Cox, P. Crowhurst, I. Di Ronco, A. Fussey, P. Sergi, A. South, N. Thiel, D. and Turton, J. (2020) Criminology: A Sociological Introduction. Oxon: Routledge. 4th Edition.

Historians and sociologists played a pivotal role in documenting and theorising criminal behaviours prior to the development of a distinctly criminological discipline.

At the time of the early classical criminological thinkers, the subject of astronomy was very much in its infancy. For thousands of years humans had wondered about the meaning and reality of the objects that could consistently be seen in the skies above. However, it was not until 1514 that Nicolaus Copernicus suggested the Sun (rather than the Earth) was at the centre of our solar system, and it was the early 17th century before Galileo Galilei first started observing the night sky through a telescope.⁴

Since its inception, the field of criminology has had to expand to encompass multiple new specialised areas - reflecting changing social awareness, technological and scientific advances, and the shifting nature of crime. Whilst astronomy has similarly experienced dramatic levels of development, it is only in the last few decades that technological advancements has allowed activity to accelerate - particularly in the commercial and defence sectors. This may be why, to date, criminology and outer space have barely ever been discussed in unison, despite some obvious concerns about social dilemmas within space exploration.

As a result, we argue in this article that issues of an 'astro' nature should be of concern to criminologists. Part of this situation is due to the rapid expansion of the space industry and the capabilities of states to now utilise off-Earth matter and resources in ever more sophisticated ways. Another reason stems from the lack of integration between the natural and social sciences where outer space is concerned. The (relatively) recent emergence of an astro-sociology is a welcome bridge between the two traditionally separate fields of study. Whilst there has clearly been some excellent academic work in astro-sociology, very few authors have discussed crimes and social harms related to the space industry (a few notable exceptions include: [1], [2], [5], [6]) despite it now being a multi-trillion dollar industry.⁷

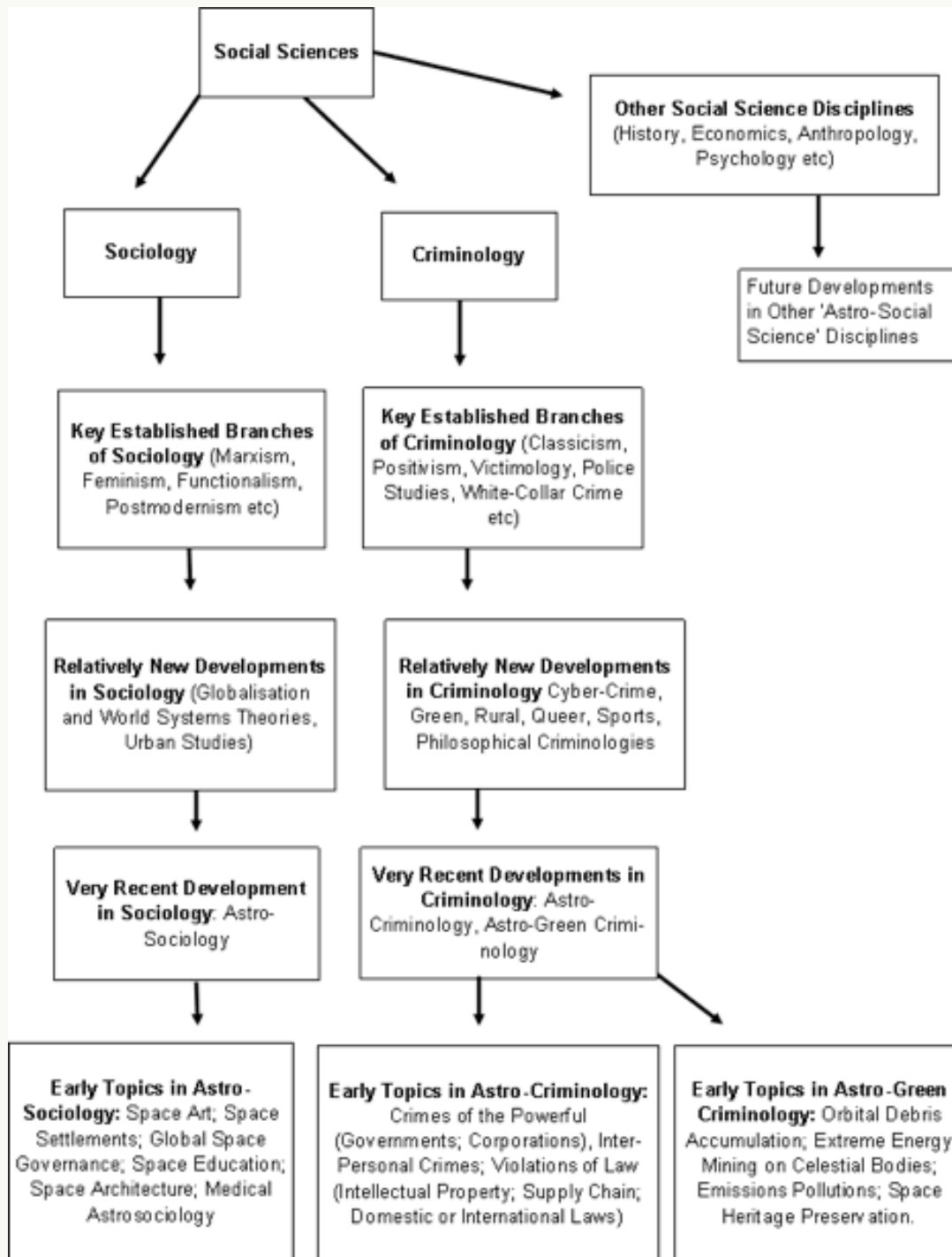
Due to these reasons, we advocate for the study of an 'astro-criminology.' We envisage this as being a sub-discipline of the larger parent discipline of criminology, much the same as other criminological offshoots (such as the established sub-fields of critical, radical, green or philosophical criminologies). Consequently, astro-criminology would run parallel to astro-sociology as depicted in Diagram One:

[4] Hawkins, S. (1988) *A Brief History of Time: From the Big Bang to Black Holes*. Great Britain: Bantam Press.

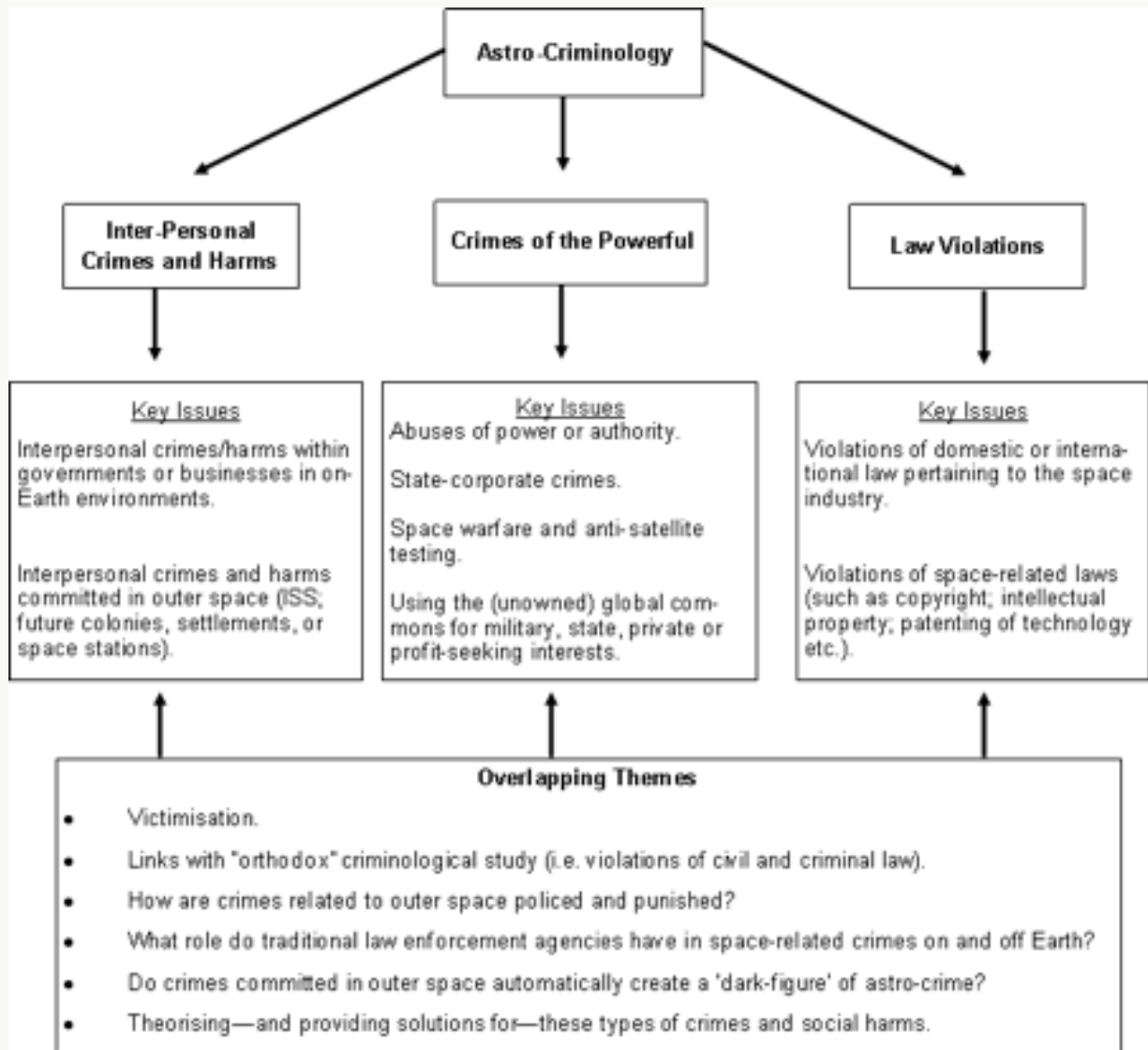
[5] Hermida, J. (2006) 'Crimes in Space: A Legal and Criminological Approach to Criminal Acts in Outer Space,' *Annals of Air and Space Law*, XXXI: 1-19.

[6] Pass, J. (2011) 'Deviance in Space Habitats: A Preliminary Look at Health and Safety Violations,' *Physics Procedia* 20: 353-368.

[7] Rao, A. Burgess, M.G. and Kaffine, D. (2020) 'Orbital-Use Fees could more than Quadruple the Value of the Space Industry,' *Proceedings of the National Academy of Sciences*, 117(23): 12756-12762.



We envisage there to be three main strands to astro-criminology: interpersonal crimes and harms; crimes of the powerful; and law violations. These issues may overlap but could easily form three distinct areas of study, as demonstrated in Diagram Two:



The first strand of astro-criminology involves interpersonal crimes and harms committed by humans where there is some significant connection to astronomy, space exploration, or the space industry. These could include crimes and social harms that occur in off-Earth spaces (such as the International Space Station), or on-Earth spaces (i.e. on-Earth company premises). Such interpersonal issues could include unwanted verbal, physical or sexual abuse, stalking or harassment, between employees when at work. [5], for example, describes a situation whereby astronauts in a social isolation experiment (to replicate conditions aboard a Space Station) became verbally, physically and sexually abusive toward one another. As [5] recalls:

‘The experiment attracted international attention as several crimes were committed in the station. Two Russian astronauts reportedly committed battery, assault and attempted murder, and one of them – the Russian commander – sexually assaulted and harassed (a female Canadian astronaut) Judith Lapierre.’

This demonstrates the importance of analysing space-related crimes drawing a parallel with traditional criminological issues.

The second strand of astro-criminology relates to the crimes and social harms committed by companies, organisations and governments operating within, or for, the space industry. This categorisation involves broader conceptions of white-collar crime and crimes of the powerful. Anti-satellite (A-SAT) testing is a good example of this, whereby states test their capability to destroy an object in LEO (such as a defunct satellite), in case they needed to do so in the event of any future space or military warfare. This is politically important due to military dependence on satellites to co-ordinate and operate specialist equipment quintessential to their operations, as well as for civil society more broadly. A-SAT testing has continued despite international attempts and treaties aimed at eliminating its existence. Both China⁸ and India⁹ have completed successful destructive A-SAT tests in the previous 13 years (2007 and 2019 respectively), whilst Russia has been accused by the U.S. Space Command of carrying out multiple non-destructive (proof of concept) A-SAT tests in 2020. Again, this demonstrates the pertinence of crimes of the powerful to the study of astro-criminology.

The third strand of astro-criminology considers law violations that are not otherwise directly covered by the other two strands (interpersonal crimes and harms, or crimes of the powerful), or by astro-green criminological issues (pollution, space mining, orbital debris etc.), although it is recognised that these issues may overlap. Such law violations could include abuses of domestic or international laws directly related to outer space, such as the 1967 Outer Space Treaty. This was developed in the Cold War era to prevent the appropriation of extraterrestrial bodies and to promote only peaceful uses of outer space.

The issues briefly discussed in this article clearly demonstrate the seriousness and importance of astro-criminological issues which we believe justifies such social problems as worthy of a discipline of its own. We envisage these issues as being separate to the better-established sub-field of astro-green criminology which has already obtained several thoughtful publications. As a result, we believe astro-criminology should sit as a sub-discipline of criminology which has strong links to similar criminological disciplines that consider crimes and harms of the powerful, such as radical and critical criminologies. It is vitally important for astro-criminology to maintain a radical and critical angle because outer space is often classified as the global commons - a physical, unappropriated space with a severe lack of law (and therefore lack of protection) for space environments and humans existing in outer space, present and future. Behaviours in outer space may therefore be harmful but not necessarily criminal.

[8] Pardini, C. and Anselmo, L. (2017) 'Revisiting the Collision Risk with Cataloged Objects for the Iridium and COSMO-SkyMed Satellite Constellations,' *Acta Astronautica*, 134: 23-32.

[9] Tan, A. Reynolds, R.C. and Ramachandran, R. (2020) 'Posthumous Analysis of the Indian Anti-Satellite Experiment: Puzzles and Answers,' *Advances in Aerospace Science and Applications*, 10(1): 1-10.

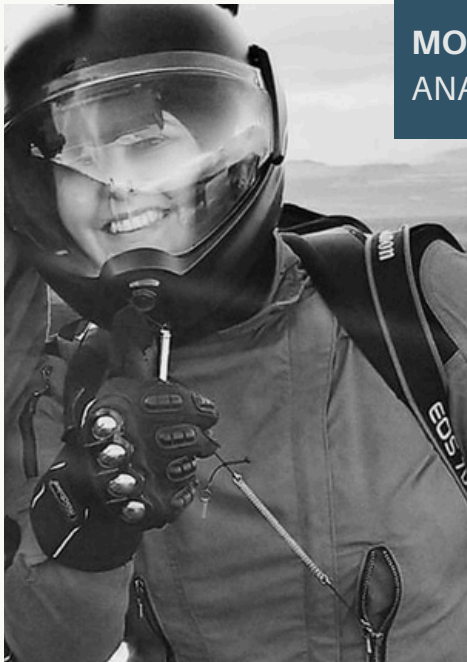
In order to instigate further academic debate on astro-criminology, we feel it is important to offer a definition of the term at the discipline's outset. This will help set parameters for further study in this important area:

Astro-criminology is the study of harmful or criminal human behaviours pertaining to outer space, regardless of whether these occur on- or off- Earth. The behaviour could result in harms or crimes that affect humans or non-humans and may create immediate visible harm (such as interpersonal violence in outer space), or may involve issues yet to fully materialise (such as the possible harms associated with future human colonies, settlements or space warfare).

In conclusion, we hope that this article has highlighted the importance of space issues that are related to traditional criminological issues. As space becomes increasingly pivotal to all our lives, the dearth of criminological attention will become all the more obvious and acute. We believe the time is overdue for the development of a radical and critical astro-criminological subdiscipline to consider these issues and hold actors to account, on- Earth and off.



A METAMORPHOSIS



MONICA PARKS
ANALOG ASTRONAUT

A Space Research Project is Born

What if I told you that you aren't good enough? You don't have what it takes. As you move through your career you will never be successful. Don't apply for that position because you don't have the right education or experience to do that. You will never make a difference. You're not suited for this level; trust me I am doing you a favor.

These are all words that bosses, instructors, and peers have spoken to me at different points in my career. I find myself recently thinking, where would I be right now if I had listened to those words? What if I had simply taken in those words and gave them power over me and never pursued anything greater? I can think of a different reality that I can see plain and clear. I never would've found myself in the space industry, and certainly never would've applied to be an analog astronaut. Somewhere amongst my DNA, maybe we can call it the stardust, I was designed to question the status quo. I don't take it like it is. I question *everything*.

I wasn't supposed to live. I've had plenty of prayers gone unanswered. I didn't get those jobs. My heart has been broken. I've lost. I've been assaulted. I've been taken advantage of. I've experienced abuse and been belittled. I've been turned away and told I was nothing. Each one of these statements are packed with stories of things I have experienced that have shaped who I became today. Those things aren't ME. They are things that happened TO me that became superpowers through *my* metamorphosis.

I have experienced rejection and countless hurdles in pursuing higher education, in careers and in relationships. I am not alone. I am one face in the crowd of many. At each of these junctures in my life I just kept going. I have always felt driven and ambitious to keep pushing myself. It isn't something I have simply chosen but I am organically made just the way I am. I used each situation as a steppingstone towards the next. One foot in front of the other. For the longest time I would even think I was odd. That something, somehow must be wrong with me. There were times when the ambition would even be too much and I would pray, beg and plead for it to be taken away just so I could accept the cards dealt to me in life. I would ask "*Why do I have to want this so much?*". It was painful to desire things that were always so out of reach.

Then through circumstances aligned by the Universe, by God, I discovered SpaceKind. Learning a little about it sounded exciting and terrifying but like so many other adventures before...I leaped. Little by little, session by session, I felt I had unlocked some secret door to *my* people. *Where have they been all my life?* Finally, I had found a group of like-minded individuals that were just like me.

Stories upon stories so eerily similar in theme even if not in detail. Suddenly my universe felt so much more intimate yet widened to horizons that I never envisioned for myself. *How is this possible?* How can these many talented, fantastic, caring, genuine people be so connected to the same worldly woes that plague me? But there is something unique, even magical, about “space people”. It’s almost as if there is something within us that maybe others have yet discovered.

Instant curiosity rattled my mind with endless thoughts, questions, wanderings, you name it. I wrote notes in the margins and in my notebooks like a literary madman. Throughout the course I was challenged by my peers to apply for an analog astronaut mission. Knowing the requirements and competitiveness I doubted I would be accepted. I began researching the different analog sites and with each one I became more and more discouraged by the listed requirements and endless list of boxes they expect the applicants to check. Once again, something I have wanted my whole was yet again completely outside of my reach.

I mulled it over for a time, discussed it with my closest space friend and was challenged more by my SpaceKind peers and I decided to make the jump. HI-SEAS (Hawaii Space Exploration Analog and Simulation) here I come. I applied feeling proud that I had but fully accepting that it would end there. I told myself to be prepared for the rejection letter and try not to think about it. Deep down I did think about it. I daydreamed because who wouldn’t? I never, even in my wildest dreams, thought this was a possibility. Upon receiving that acceptance letter, seeing the black & white letters across the screen that my perseverance had paid off. The unexpected had happened. The Universe, somehow, had listened. Other analog astronauts that I knew that had completed their missions already shared their stories of rejection and fears of rejection, how hurdle after hurdle, redirection, etc. had ultimately guided them right where they were called to be in the time that was theirs.



In the days leading up to the mission I couldn’t help but wonder if the other applicants to my mission felt the same. Thus, my research project was born. I had to know what this secret was. I believe there is a lot of assumption that when one wants to achieve something as great as being an astronaut it is something they not only dream about from a young age but they plan every course of their lives, education and careers around the pursuit of making it their reality. On the surface it would appear to the rest of us they had it together all along and the path was laid before them.

Introduction: Are Space People More Resilient

There is something identifiably different about the spirit of perseverance of space people versus non-space people . Time and time again I have witnessed both groups of people encounter hurdles and diversions of their intended paths. During this research, the non-space people were halted dead in their tracks. They gave up and just stopped trying. When making the same observations of space people the spirit of perseverance excelled. Instead of these same hurdles and diversions stopping them, those things became a catalyst to something bigger and, in some cases, greater than they imagined.

Just as our science has evolved, we must also evolve as a species. The approach we take with the human experience in space exploration begins within ourselves and that includes the egos we have, our insecurities, the weight of rejection and crushed dreams. Everyday work environments are poisoned by someone's insecurities, self-doubt, feelings of injustice and other emotions that drive our darker side. Those feelings lead to lack of communication, failure to pay attention, and mistakes. Actions are then driven by miscommunication, hate, jealousy, etc. Simply put, we must check that at the airlock. We as a species should be demanding that along with the strict procedures, processes and guidelines we have to also weave into our fabric the empathy, healing and self-awareness to let go. Imagine if we approached life by letting go of the dark before we let it take seed.

Remember how much John Glenn wanted to be the first American in space. He had worked and trained his entire career in the hopes of being selected. He felt he was ready and believed he was the appropriate candidate. But as we know, history had its eyes on Alan Shephard. Each of us can put ourselves in John's shoes and imagine the sting of disappointment, sadness and even jealousy that must've coursed through his veins. Little did he know that something greater, meant just for him, was waiting in the not so distant future. He persisted and continued to step out in faith not knowing what lay ahead. He used that rejection as a catalyst into something that, at that time, he had not yet imagined as a possibility. History would forever remember him as the first American to orbit and everything changed after that. While we never know what our own futures hold for each of us, we have to keep our eyes fixed in one direction and that is forward. You never know what is around the corner and if you get caught up in the wrong stuff, you'll never experience the right stuff.



My Experience on an Analog Mission

When comparing my connection with my crew while on mission at HI-SEAS and with my crew on the SpaceKind Leadership Council there is a remarkable difference. During HI-SEAS, as time pressed on and each day presented new challenges it is true that our crew naturally became closer to each other. While you are tossed into this intimate environment as strangers, you emerge closer and more connected. Open communication occurs quickly, and the ice is broken within the first few days on mission allowing paths of openness and organic bonding to begin.

For me, being the one crew member who came from a different background than the rest and not being someone who worked in the space industry, I anticipated those facts to affect the connection between myself and the crew. While I couldn't relate to all the academic conversation and couldn't share college stories it didn't diminish the connection. Although the paths were each laid in their own intricate ways, we each had parallels. Every one of us had experienced rejections while pursuing our careers that turned into drive and ambition to keep moving forward. Not even one of us ever took those "no's" as our final answers. Each hurdle turned into more opportunity and from those opportunities evolved more experience, more networking, more knowledge, more connection. On Day 1 of our mission a few of us met at baggage claim while awaiting the remaining crew and began to get to know each other. I sat there in awe overhearing another crew member who has extensive education and credentials express their doubts to apply to the mission. I heard this person state they knew it was competitive and doubted getting accepted but applied anyway.

The first 4 days were hardest. The lack of intimate connection with the only living beings near me for the foreseeable future was palpable. I was feeling inferior to my peers and feeling doubtful of my ability to achieve anything while on mission. I began sending emails back home to my husband expressing my discomfort and how I didn't feel that I belonged and was wondering why I had been chosen. I was doubting my own ability to find something to connect with the rest of the crew. I was afraid of not being accepted or viewed as not belonging. The imposter syndrome was so real, and I felt if they found me out it would be crushing. Here I was, having been selected. I made it. Hundreds per mission apply for this spot and here I made it. I had dreamed of being selected and longed for what it would feel like. In my heart it wasn't just for me but for everyone back home, for my community and for all of those people that struggle with pushing onward with things they dream of achieving. Although we had email comms back home it wasn't the same as being able to have face-to-face conversation with someone you know and trust. I felt very alone and, on an island, both literally and figuratively. Our Commander had expressed in our training that she was there for us as a group and individually and while I believed it and I knew I could go to her, there was such hesitation because I didn't know her. Outside of the very little interaction we had had up to that point she was still a stranger to me.

During the first week each crew member took a turn to tell his or her story. Everyone shared their love of space and how they got to where they are. The parallels were wildly similar. Each crew member would encounter some type of diversion at some point in their lives and they would adjust tactics and just keep pressing. One experience would lead to the next and the next and so on. It's quite fascinating how brokenness and disappointments lead to something magnanimous when you just absolutely refuse to give in to the rejection. I am so amazed at how people push themselves. I am so incredibly interested to unlock more knowledge of what it is that really makes driven people so driven.

It was a similar situation with the non-space people. I would ask a similar line of questioning and some were just organically "exposed" during their story telling. One surprising element in the non-spacers that I didn't expect was that each one of them I observed all shared the same feeling of being in their adulthood and still not knowing what they were truly passionate about. They still didn't know what would truly make them happy in their careers. When asked they couldn't come up with an answer. Each one is working in areas completely opposite of something that makes them happy and they have typically taken the same types of jobs. They all equally felt they simply accepted what was handed and just settled. Some were college graduates, and some were not but all of them shared the same "I don't know what makes me passionate and I don't know what I want to do." It made me so sad because it felt so empty and lacked hope. Overall, it felt as if you have these perfectly capable people that have been brain trained incapable of dreaming of something better for themselves. Over time, they have been fully convinced that they either didn't deserve the happy ending or never felt driven enough to continue the pursuit.



Proposal for Future Research

If we approach challenges, rejection and turns of events by using them to encourage ourselves rather than be discouraged by them we grow stronger. That strength is then used as motivation and drive to grow our natural perseverance. The human spirit is an unstoppable force when it's inspired. While inspiration can come from many places the most powerful is the very rejection or turn of events experienced. In the absence of that you wouldn't feel the insatiable hunger, the drive to keep going. Imagine for a moment if everything you have ever worked for, every achievement earned had been just handed to you. Think of the lessons you learned along the way and how with each moment you were molded and made into a new person. A true metamorphosis. While some of us are born with more natural inclinations to use these as superpowers, some are not. I believe that we need to create different types of training that help guide, motivate, mature, enhance and bring awareness to every walk of life. If it truly is going to take everyone to get to space time and time again and expand the exploration of our universe then we have to also evolve the way we approach the training. It cannot continue to only be inclusive of a niche group of people, but it must be designed for every human. It is going to take every one of us, baggage and all.

Crews that work through new adaptations of training such as SpaceKind are more connected with their crews prior to mission and are more equipped with tools, resources and support to be successful and not just a good crew member. Embracing the rejection, the dark experiences and using what you've learned as a superpower makes you a better person. While we already know the importance of analog missions there is an opportunity for enhancing the research performed at these habitats. In order for us to have dependable data to review we need a research project that focuses on studying the output from three different analog crews. One crew should be complete strangers (as per the typical), one crew needs to have had 3-6 months of virtual communications leading up to the mission and one crew needs to have been a crew that had dedicated deep intimate connections as a result of attending SpaceKind Level 1 and Level 2 training (crew leadership included). My theory is with each crew we will see team cohesion and connection, but the more intimate the crews are with each other leading up to the mission will determine how truly successful the research is. Each crew should have assigned tasks, projects, surveys, situations/obstacles to overcome, etc. Within these crew's diversity is key. It must be inclusive of not only a multicultural collection of people, but it should not be limited to only those with higher education and experience working in the space industry.

If we are to demand that "space is for everyone" then it is time we put action into that statement and walk the talk. If we continue the path of only learning and listening from one perspective, then how will we ever adapt? It simply would be nothing more than regurgitation of the same. We invest in simulating science, but we also need to invest in simulating the human experience. That is the invisible and vital component that ultimately determines mission success.

CIVIL SOCIETY, ASTROSOCIOLOGY, AND THE FUTURE SPACE ENTERPRISE: TIME TO MOVE FORWARD



KEN HODGKINS

PRESIDENT OF INTERNATIONAL SPACE ENTERPRISE
CONSULTANTS

The scope and nature of the space enterprise is evolving rapidly at all levels. While policymakers and the public focus on the latest high-profile achievements, as they rightly should, the time is now to broaden our discourse on space writ-large, to an intellectual and sociology examination of space and society. The inward-looking exercise (space to Earth) is well established but a sustained multi-disciplinary review of what it means to have a society in space is long overdue. The spirit of adventure and discovery is situationally based, it does not embrace the concept of permanency once a mission is achieved. That is to say, through adventure and discovery what is to happen to man

at a permanent place off Earth? We have the experience of 2 decades of permanent human presence on the International Space Station. We have learned how astronauts interact at an individual level in an isolated and austere environment, but the human experience is periodic in that crews are regularly replaced. The norms of behavior are legally dictated by the governments operating the ISS based on established astronaut protocols, and national and international law. But the ISS is a research facility tended by humans, not a habitat for societal development in space. The question remains – Should we achieve the ability of long-term or multi-generational human presence around the Earth or on other Celestial bodies, what is the societal construct that allow individuals to interact in a safe, predictable, and nurturing system?

There are no universal requirements for a person to fly to Earth orbit or beyond. Today, people are selected by their governments (based on government driven criteria) to go to space or people just pay for the experience. But if humankind desires or is destined to exist off Earth will this be solely a function dictated by one or more governments as to who will go, where, when, how and under what conditions for human interaction?

An inward examination of the space enterprise recognizes that space systems are vital to sustainability, strategic stability, economic growth, scientific discovery, and the betterment of the human condition. Policymakers benefit enormously from a sustained and focused multidisciplinary examination of the current state-of-affairs in space law and policy, and the ways and means for to mold the future of space utilization. While the body of international space law and practice instruments have been established and serve as a roadmap for national security, civil and commercial space activities, much work needs to be done at the national level to give effect to the implementation of obligations under the UN space treaties. This is where we stand.

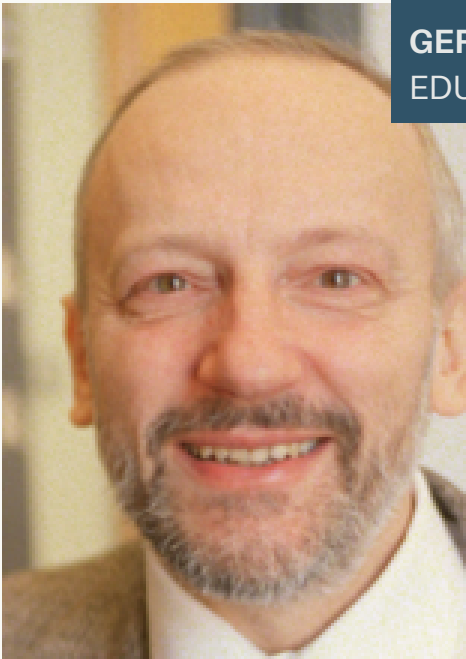
But non-government actors need a global framework that is transparent, level, and predictable. This can only happen with a bottom-up approach that relies on the advice and experience of civil society. The rule of law in space must be flexible, inclusive, and permissive for the next generation of space adventurers to excel. Countries and companies transitioning towards the new global space economy will need an unbiased and thoughtful institution that looks at the totality of the challenges ahead.

The outward examination of space and society demands the same requirements but in a different realm – astrosociology. Civil society must be at the center of creating a sustained process whereby national and international policymakers are working from an informed body of knowledge that is multi-disciplinary at all stages. Under the 1967 Outer Space Treaty the exploration of outer space shall be carried out for the benefit and in the interests of all countries. Hence, the conditions for activities are not to be dictated solely by states that have the ability to leave Earth. Now that governments and commercial entities are looking to a sustained human presence on the Moon and Mars and in Earth orbit now is the time to study the norms that would be applied for a societal order that would help make this a reality.

The issues at hand are readily known and deserve further elaboration through a multi-disciplinary process. Civil society involvement is crucial to set the path from Earth to the outer reaches of the galaxy. Governments cannot be expected to tackle this on their own. The policymaking apparatus historically is many steps behind technological and societal advancements so space ventures cannot wait for governments to get organized in this regard. There are various non-governmental scientific and research organizations that could be utilized but that would require them to make structural changes. The UN Committee on the Peaceful Uses of Outer Space is an effective body for the promotion of international space cooperation but it a governmental body where civil society is only an observer. The challenge is to organize a reliable and objective platform for civil society to gather on a regular basis to study the issues of astrosociology and make recommendations for moving forward.

Many will argue that living as a society in space will never happen or is so far in the future that it is premature to have this debate. This is not reflecting reality. No one has a crystal ball to predict what may or may or may not happen in space. The point is that we should have the foresight to take what we know and engage now as an important contribution of civil society to the future space enterprise.

WHY I TEACH ASTROSOCIOLOGY



GERHARD SONNERT

EDUCATION SPECIALIST & LECTURER ON ASTRONOMY

Starting in the fall semester of 2017, I have taught the course ASTRON 5 Astrosociology in the astronomy department of Harvard University. In this brief essay, I reflect on the reasons for developing and teaching that course. First, I discuss the pedagogical approach underlying the course that, I believe, makes it a valuable contribution to the students' education. Second, I note how the teaching of Astrosociology benefits the growth of the field of Astrosociology and also touch on the role the Astrosociological Research Institute (ARI) plays in that process.

I.

My main pedagogical intention has been that the course should seriously confront the students with the "other," the maximally strange that resides far outside of the familiar reality they know. This should help them in developing an open mind that is able to transcend the bounds of conventional thinking.

Here are three examples. The discussion of extraterrestrial intelligent life is a central part of the course. If evidence of extraterrestrial intelligence was found, or, even more dramatically, if contact with extraterrestrials was made, the ensuing repercussions in terms of technology, culture, and social structure would strain or obliterate the societal status quo. When the fabric of society unravels, its individual strands become visible to the students, who are then challenged to exercise their sociological imagination about how, and if, these strands would be interwoven again.

In another unit, in which students learn about cosmic threats, they concretely engage with a simulated scenario in which an asteroid is on collision course with Earth. Here students learn about decision making under uncertainty, time pressure, and conflicting interests. They have to weigh the potential costs in political power, economic wellbeing, and human lives associated with various possible courses of action. This introduces them to thinking about strategies of disaster mitigation.

A third aspect of the course pertains to "generation starships"—a class of science fiction literature in which a space ship travels for centuries to a far-off destination and the people on board live and reproduce for many generations—and to plans for founding a Mars colony, a possibility that might become a reality during the students' lifetime. Exercises about these topics engage the students in thinking about how a "social contract" among humans is set up and how and why it might evolve over time.

In this way, students revisit the basic concept of social contract that 17th and 18th Enlightenment theorists—Hobbes, Locke, and Rousseau foremost among them—established as the normative foundation for their theories of government and the state.

Taking the astrosociology course has kindled or strengthened some of my students' desire to enter a career in space exploration, certainly a fast-expanding field replete with exciting opportunities. However, even if students do not make space exploration their life's work, and even if none of the covered cataclysmic events—cosmic threats, extraterrestrial contact, and the like—occurs in their lifetimes, studying astrosociology is, to reassert the central pedagogical purpose of the course, valuable for all students. It stretches their minds beyond the familiar and trains a broad, critical, and flexible habit of mind that will help them react well to strange situations. Ultimately, by confronting the alien, they learn about themselves.

II.

The development of astrosociology is itself a topic of sociological study. As sociologists have been examining how scientific disciplines come into being and grow (and sometimes wither away), astrosociology serves as what Robert Merton would call a self-exemplifying case. Teaching a subject at the university level is one of the important intermediate steps on the way to it becoming a full-fledged field, which in its final stage would include degrees, faculty positions, and perhaps even departments. Thus, teaching astrosociology is a crucial step toward establishing astrosociology as a scholarly field or discipline. This is the second reason why I teach it.

Other intermediate steps that typically occur during the development of a discipline include the foundation of a scholarly association (in this case, ARI) and the foundation of a Journal (in this case, the Journal of Astrosociology). ARI in particular has a pivotal role to play. ARI is young and small; but with the inherent vulnerabilities come opportunities. This is a moment of fluidity in a fledgling field, when a fresh start can be made that might avoid problems besetting older disciplines. The reality of inequities by gender, race/ethnicity, and disability has compromised the universalist ethos of science in many scientific fields. Once institutional structures and cultural definitions and stereotypes have come into being, they are difficult to dispel. Doing things right from the start is easier than attempting to fix them later on. Thus, ARI has the chance to help making astrosociology a field that is intellectually inclusive in approach and methodology and also welcoming to everyone who desires to contribute, regardless of who they are.

PRESERVING HUMAN HERITAGE IN SPACE TO ACHIEVE THE UN'S SDGS

STANFORD STUDENT SPACE INITIATIVE (SSI)
WORKS ON ROCKETS TO BALLOONS TO SATELLITES TO
POLICY AND HAS SUPPORTED THE PROTECTION OF HUMAN
HERITAGE IN SPACE.



STANFORD STUDENT
SPACE INITIATIVE

Introduction

There is no better time than now to be a student preparing to enter the space industry. The past few years have shown us the awe-inspiring potential of space exploration and, more importantly, cemented the certainty that this sector will blossom in our lifetimes. We are eager to see what space exploration has in store, but are also aware of the challenges that have emerged in space and on Earth. As young space enthusiasts and citizens of Earth with high hopes for the future, we care deeply about the decisions humanity makes that impact space and Earth and that will affect our generation and those to come.

It goes without saying that the space around and well beyond our Earth offers us tremendous value and inspiration. Many technologies and infrastructures we have today exist because of our activity beyond Earth. Space has played host to many triumphs of humanity, including goals that go from impossible to accomplished at ever increasing speeds. Humanity has already achieved many incredible firsts in space, and the remnants of these accomplishments remain strewn across our Moon, Mars, Venus, and even floating through and beyond our Solar System. As we continue the human journey off our home world, one thing is certain: we need to protect these pieces of our universal history and heritage in space now, before physical or cultural damage becomes irreversible. Indeed, the memorialization, protection, and preservation of heritage sites in outer space directly supports the United Nation's (UN) Sustainable Development Goals (SDGs) and will improve life for humans on Earth and beyond.

Definition of Heritage Sites and Heritage Preservation in Space

Before we can discuss why it is important to preserve cultural heritage in outer space, we must first define what heritage preservation is and what it entails. Heritage preservation is the protection and preservation of artifacts that possess historical and cultural significance, such as landmarks, buildings, objects, and natural features. The nature of preservation differs from site to site. For a historical building, conservationists may need to make repairs, add weather-proofing, and pay property taxes. In contrast, for a natural feature they may need to encourage sustainable tourism and protect the feature from poachers and vandals. However, as we will discuss later, these requirements are different for heritage sites in space.

The UN plays a critical role in protecting human cultural heritage. The United Nations Educational, Scientific and Cultural Organization's (UNESCO) World Heritage Committee implements the 1972 Convention Concerning the Protection of the World's Cultural and Natural Heritage (World Heritage Convention) which has been ratified by 193 nations.¹

The Committee receives nominations for heritage consideration and, if a site is deemed suitable, can provide financial support to requesting States via the World Heritage Fund. Rather than managing sites itself, the World Heritage Center works with member States, encouraging them to protect, manage, and report on heritage within their borders. The World Heritage Center supports countries by providing technical training, financial assistance, and supporting public awareness campaigns. To date, the Committee has confirmed 1,121 World Heritage Sites in 167 countries.²

For something to qualify as a UNESCO World Heritage Site, the World Heritage Convention indicates that it must be a site of "outstanding universal value" and meet at least one of the ten criteria outlined by the Convention. One criterion seeks sites that are: "an outstanding example[s] of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history."³

Humanity has been in space for over sixty years, and there are numerous heritage site candidates worthy of protection. There are many areas on celestial bodies containing spacecraft, landing sites, equipment, or other historical artifacts that represent significant first achievements for humanity and illustrate significant stages in human history. For example, the home of Luna 2, Tranquility Base, and the site of Chang'e 4 firmly meet this criterion. Luna 2 was the first spacecraft to land on the Moon and the first human-made object to come in physical contact with another celestial body.⁴ Tranquility Base contains the landing site of the United States's 1969 Apollo-11 mission. This site is the result of monumental technological achievements that enabled a turning point in human history - the first time a human set foot on a celestial body other than Earth.⁵ China's 2018 Chang'e 4 was the first mission to successfully land on the Moon's far side, and was also the first to germinate a plant from Earth on another celestial body.⁶ These sites are unquestionably of "outstanding universal value" and, per the World Heritage Convention's criteria, would solidly qualify as world heritage if they were on Earth. But, unlike the 1,121 sites down here, these spacecraft, boot prints, and pieces of equipment all remain unacknowledged and unprotected.

[1] "Convention Concerning the Protection of the World Cultural and Natural Heritage." UNESCO World Heritage Centre, whc.unesco.org/en/conventiontext/.

[2] Centre, UNESCO World Heritage. "World Heritage List." UNESCO World Heritage Centre, whc.unesco.org/en/list/.

[3] Centre, UNESCO World Heritage. "The Criteria for Selection." UNESCO World Heritage Centre, whc.unesco.org/en/criteria.

[4] "LUNA 02." NASA, NASA, 14 Feb. 2018, solarsystem.nasa.gov/missions/luna-02/in-depth/.

[5] Smith, Yvette. "At Tranquility Base." NASA, NASA, 20 July 2018, www.nasa.gov/image-feature/at-tranquility-base/.

[6] "Chang'e-4." The Planetary Society, www.planetary.org/space-missions/change-4.

Even more, in the short term, at least, protection is simple. It will not require millions of dollars or the moving of developments or roadways. Since outer space generally lacks weather, moisture, bacteria, and many more of the dangers plaguing heritage sites on Earth, heritage protection in space would simply entail keeping human activity away from the sites.

Heritage preservation in space can follow a framework like that set up on Earth, but with one important difference. On Earth, nations may only nominate heritage sites which are within their sovereign territory. Article II of the Outer Space Treaty of 1967 indicates that celestial bodies are “not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.”⁷ Because of this, the UNESCO procedure cannot be adopted for nominating and selecting heritage sites in space. Thus, we support the mission and work of For All Moonkind, which advocates for the development of a new convention to protect heritage in outer space. Although we cannot use the same legal framework as on Earth, these sites mark crucial moments in human history and are just as worthy of celebration and protection as their terrestrial counterparts.

Overarching Goals of the SDGs

In 2015, the UN unveiled the SDGs as the common objectives humanity should strive for in coming years. The 17 goals seek to address the great environmental, political, economic, and social problems in the world. Expanding on the Millennium Development Goals that preceded them, the SDGs place their focus on sustainability as the common thread between all these issues and as the key to ensuring that progress is not destructive to any nations, people, environments, or future generations. More broadly, the SDGs themselves were created to “produce a set of universal goals that meet the urgent environmental, political and economic challenges facing our world.” The 17 specific SDGs are intended to serve the larger goal “to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030.”⁸

To achieve these goals, the UN emphasizes the need for international cooperation. Countries of all levels of development must work together to achieve the goals, enacting policies and programs both within their own borders and with other nations. And, to achieve the SDGs on Earth, we also have to look to space. Outer space lies outside of the sovereignty of any established nation, and so ensuring sustainable use and development of space and its resources will require international bodies like the UN to facilitate a collaborative effort. The underlying hope of the SDGs is to facilitate human cooperation to achieve peace and prosperity for all people, and we believe that preserving human heritage in outer space is a crucial step in achieving these ideals on Earth and in space.

Connections Between Preserving Heritage Sites and Achieving Goals on Earth

[7] United Nations Treaties and Principles on Outer Space: Text of Treaties and Principles Governing the Activities of States in the Exploration and Use of Outer Space, Adopted by the United Nations General Assembly. New York: United Nations, 1966. Print.

[8] “THE 17 GOALS | Sustainable Development.” United Nations, United Nations, sdgs.un.org/goals.

In 1987, the Acropolis in Athens was officially designated as a UNESCO World Heritage Site due to its “outstanding universal value.” UNESCO reminds visitors to its website that “[o]n this hill were born Democracy, Philosophy, Theatre, Freedom of Expression and Speech, which provide to this day the intellectual and spiritual foundation for the contemporary world and its values.”⁹ This beautiful site is a monument to a shared point in human history, the birthplace of ideas that impact almost every person in the world today. The celebration and preservation of the beginnings of democracy and free speech reminds us of why those ideas are still important and how they now connect billions of people around the world.

The UN Sustainable Development Goals strive to ensure that “all people enjoy peace and prosperity”¹⁰ and to “meet the urgent environmental, political and economic challenges facing our world.”¹¹ To achieve these ideals worldwide, humanity has to learn not only to celebrate our differences, but also to remember that there is so much more that unites us than what divides us. We need international cooperation to face challenges and solve issues affecting people all around the world, and this cooperation can only come when different peoples are willing to respect and learn from one another. The Acropolis was built by and is housed in one nation, but millions of people from dozens of different countries visit it and learn from it each year. Just as, for example, the Apollo 11 mission was facilitated by one nation, many other nations contributed to the research behind it, and millions of students around the world study it every year. The Acropolis is a monument that is not just significant to Greek history, but a fixture of human history, providing immeasurable educational and cultural opportunities and a constant reminder of a shared culture that connects people together. The Acropolis is not alone in this respect - there are hundreds of cultural heritage sites around the world that provide a similar value to humanity. And just as these heritage sites on Earth help humans celebrate our common origins and remember our history, heritage sites in space will do the same for future generations.

The preservation of heritage sites in space, like the lunar landing sites of Apollo 11, Luna 2, and Chang’e 4, will remind people today and space-faring generations in the future of a universal point in human history, the moment that set humanity on the path to becoming a truly interplanetary species. It is easy today to think of these lunar exploration missions as the achievements of individual nations, but elevating these places to heritage site status would make it clear that they belong to all people. Humans would have never made it to the Moon without centuries-worth of work from scientists, engineers, and other explorers all around the world, and preserving heritage sites on the Moon and elsewhere in outer space will be a celebration of that universal human achievement. If we hope to achieve global peace and prosperity, now and forever, then we must start valuing and preserving the accomplishments that remind all of humanity that, in the face of a vast universe, we are not so different after all.

[9] Centre, UNESCO World Heritage. “Acropolis, Athens.” UNESCO World Heritage Centre, whc.unesco.org/en/list/404/.

[10] “Sustainable Development Goals: United Nations Development Programme.” Sustainable Development Goals | United Nations Development Programme, www.undp.org/sustainable-development-goals.

[11] “Background of the Sustainable Development Goals.” UNDP, www1.undp.org/content/seoul_policy_center/en/home/sustainable-development-goals/background.html.

Using Heritage Sites to Establish Legal and Ethical Precedents in Space

What happens to international laws and rights when human life is no longer bound to Earth? Existing legal and ethical frameworks falter once we escape the confines of the planet: There are no land rights on the Moon, no environmental policy that considers the red plains of Mars.

As a global community we have agreed upon certain “universal” rights and values, but the universe we have historically had in mind has always been just Earth. So, what does it truly mean to be universal? It is not really about land. Human rights exist not in a finite geographic limit, but within the people that inhabit them. When the first human ventured to Antarctica, they brought their human rights along with them. And when Yuri Gagarin went to space, when Neil Armstrong stepped on the Moon-- their rights did not disappear. Human rights and human values already exist in space, as long as there are people there to embody them.

And yet our laws and structures don't reflect this. Right now, space law is still a developing and aspirational field. As more people go to space, as they stay there longer, as permanent structures are built and communities formed around them, there will be a growing need for cohesive space policy. Society in space will be an extension of society on Earth, and it is important for our laws to reflect this. Humanity is on the cusp of becoming a truly spacefaring species, and the longer we wait to establish a precedent of universal rights and values in space, the more difficult it will be to implement later. Since heritage sites are already protected and valued on Earth, preserving heritage sites in space is an excellent first step to setting the standard that human values and agreements apply everywhere that there are humans.

Legally protecting human heritage sites in space sets the foundation for protecting sites of significant cultural and natural significance as well. Few legal frameworks currently exist that limit commercial entities' access to certain resources or terrains in space. As a result, as companies develop technologies to gain access to the Moon and other bodies, they will be able to use new resources with little regulation. Some companies may take advantage of this legal void by overexploiting the assets available to them. For example, water, soil samples, and other materials on the Moon are both finite and valuable. If spacefaring actors gain unregulated access to lunar resources now, that could lead to short-term, unsustainable activities on the Moon that stifle future development and create inequity for non-spacefaring entities that may become spacefaring in the future. If certain nations or companies are able to completely dominate space in the coming decades, there is less incentive for other groups to continue working hard to develop new technologies. Outer space should not belong to any one entity, and we should strive towards a system which benefits all of humanity. To achieve prosperity on Earth, every interested party must have the chance to access and use space. Thus, developing a plan to preserve human heritage in space has stakes beyond the existence of the heritage sites themselves; it is the first step in establishing a process by which resources, both cultural and natural, may be legally protected.

Bodies in space, such as the Moon, are also of cultural significance around the globe.

For example, human beings' awareness of the Moon and stars dates back as early as 32,000 B.C., as evidenced by cave art depicting phases of the Moon.¹² These early cave drawings indicate early humans learning to understand the concept of time, seasonal cycles, and mathematical sets (same source as before). The ability to see and use the Moon as a means to track time anywhere on Earth led to the independent development of lunar calendars across many cultures. The Chinese,¹³ Islamic,¹⁴ Hebrew,¹⁵ Nepal Sambat,¹⁶ Yoruba,¹⁷ Igbo,¹⁸ Haida,¹⁹ Celtic,²⁰ Maōri,²¹ and Javanese²² calendars all follow the lunar cycle and belong to cultures and religions originating across the globe. The reconciliation of some of these lunar calendars with the year as marked by a revolution around the sun points to a significant understanding of mathematics and the impact of heavenly phenomenon on life on Earth. These lunar calendars mark religious observances and celebrations, dates of historical importance, and ties to cultures dating back thousands of years. Celestial bodies like the Moon are an almost universal element of human culture, and thus the protection of space is of importance to all of humanity. Preserving heritage on the Moon and other celestial bodies will ensure that the cultural value of these objects is also respected, and it will reinforce the notion space is for everyone, not just current space-faring nations.

[12] "The Oldest Lunar Calendars." NASA, NASA, [sservi.nasa.gov/articles/oldest-lunar-calendars/](https://www.nasa.gov/articles/oldest-lunar-calendars/).

[13] "Chinese Lunar Calendar." China Culture, en.chinaculture.org/library/2008-02/01/content_26219.htm.

[14] "Islamic Calendar." Encyclopædia Britannica, Encyclopædia Britannica, Inc., 16 Apr. 2021, www.britannica.com/topic/Muslim-calendar.

[15] "Hebrew Calendar." Israel Science and Technology Directory, www.science.co.il/jewish-studies/Hebrew-calendar.php.

[16] Nepal Sambat, www.nepalsambat.com/.

[17] <http://www.afropedia.org/yoruba>

[18] News, NBF. "DAY MASSOB TOOK OVER NRI KINGDOM." Nigerian Voice, The Nigerian Voice, 21 Mar. 2012, www.thenigerianvoice.com/nvnews/85709/1/day-massob-took-over-nri-kingdom.html.

[19] "Haida Calendar." Haida Language, haidalanguage.blogspot.com/2011/11/haida-calendar.html.

[20] "Celtic Calendar." New World Celts, www.newworldcelts.org/celtic-calendar.html.

[21] New Zealand Ministry for Culture and Heritage Te Manatu Taonga. "Maramataka – the Lunar Calendar." Te Ara Encyclopedia of New Zealand – Te Ara Encyclopedia of New Zealand, Ministry for Culture and Heritage Te Manatu Taonga, 30 Sept. 2015, teara.govt.nz/en/maramataka-the-lunar-calendar.

[22] PROUDFOOT, IAN. "In Search of Lost Time: Javanese and Balinese Understandings of the Indic Calendar." *Bijdragen Tot De Taal-, Land- En Volkenkunde*, vol. 163, no. 1, 2007, pp. 86-122. JSTOR, www.jstor.org/stable/27868344. Accessed 14 May 2021.

Having cultural heritage sites in space will also make it easier to establish natural heritage sites. One of UNESCO's criteria for natural heritage sites is: "to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance."²³ Based on the small corner of our solar system that we've already explored, it seems very likely that there will be areas of either great scientific interest or great beauty that will warrant preservation. Scientific discoveries and developments in space are crucial for a better understanding of Earth and for the safety and success of future space exploration. Already having cultural heritage sites established in space will make it significantly easier to recognize and protect natural heritage sites when the time comes.

One example of both human and natural heritage is the ice deposits in lunar craters. This ice has been deposited on the Moon across millions - perhaps billions - of years, collecting material from comets and asteroids. A sample of this ice could give insight into the formation and history of the solar system, information vital towards understanding the history of our home planet and the human species' place in the universe. This ice is of natural value as well, as it tells a story of meteorite impacts on the Moon's surface and of natural phenomenon such as solar wind. However, this ice is also at risk of being used unsustainably by the companies and nations that gain access to it. Sending water from Earth to the Moon costs \$2,000 to \$20,000 USD per kilogram, so water is a valuable resource in space despite its abundance on Earth. Water can be split into hydrogen and oxygen, which can then be used for rocket fuel and power. One of the scientists who worked on a mission searching for water on the Moon describes the ice as "the most valuable piece of real estate in the solar system."²⁴ While its short-term uses are great, using this ice unsustainably would have consequences on both human and natural heritage, and the ice deposits would benefit from legal protection.

Establishing heritage sites will institute a set of rules governing the protection of the site, keeping potentially damaging activities a certain distance away from the site. These rules are the first step towards creating a standard for the development of a regulatory framework in space, and the rules governing heritage sites may be the simplest to enforce and the most universally valued.

As discussed, the preservation and restoration of cultural heritage symbols is beneficial for numerous reasons. Thus, cultivating an atmosphere in which cultural heritage symbols are truly and intrinsically valued would prove immensely beneficial. The importance of fostering this environment is especially pronounced when considering Earth's tainted legacy of hastily protecting and restoring cultural and environmental wonders only after they have been exploited, which has led to immense loss of valuable non-renewable cultural resources.²⁵ Now presented with the prospect of a new frontier, it is imperative that this is interpreted as an opportunity to start on a clean slate.

[23] Centre, UNESCO World Heritage. "The Criteria for Selection." UNESCO World Heritage Centre, whc.unesco.org/en/criteria.

[24] "Ice on the Moon." NASA, NASA, nssdc.gsfc.nasa.gov/planetary/ice/ice_moon.html.

[25] "A Historic Resolution to Protect Cultural Heritage." UNESCO, 19 Oct. 2020, en.unesco.org/courier/2017nian-di-3qi/historic-resolution-protect-cultural-heritage.

This time, however, it's critical that space pioneers act prudently by setting the precedent for cultural heritage preservation so that the pristine and untouched wonders of space aren't condemned to the same regrettable fate endured by those on Earth.

But, why is now a uniquely crucial time to set this example? Setting the precedent for valuing space heritage at the start of this new age of space exploration can help cultivate an environment in which these symbols are truly and intrinsically valued, which may help with preventing future contention.²⁶ Additionally, the uniquely valuable designation as a universal heritage site will provide an unmatched sense of legitimacy and access to resources for preservation. Among other examples, Machu Picchu's world heritage site classification has enabled the renowned world wonder to balance prudential preservation efforts and healthy economic/tourist interests.²⁷ In particular, the invaluable monetary and structural support courtesy of the world heritage classification has helped Machu Picchu recover from devastating earthquakes and torrential rainfall, which would otherwise prove difficult for local agencies to handle on their own considering its remote, isolated geography.²⁸

In this way, Machu Picchu's incredible support system serves as a promising testament for how a universal heritage site classification could uniquely aid in preserving space heritage resources. After all, with cultural resources as isolated as those in space, it becomes critical that sufficiently respected classifications are employed to ensure the preservation of these treasures. And, when executed properly, these sites can serve as a source of universal pride. Continuing the example of Machu Picchu, while the site is physically located in Peru, it's celebrated as a cumulative world wonder because it's so universally supported and valued.²⁹ Thus, this classification for space heritage would allow for widespread appreciation for space and also allow for equitable contributions from all countries. In this regard, the universal heritage designation is a means to historical and cultural preservation, economic and touristic promise, and a pledge to continue celebrating humanity's most crowning achievements.

Dangers of Not Preserving Heritage

Just as the benefits of preservation can be observed from Machu Picchu, the costs of not preserving are evident as well. Failing to preserve heritage can significantly harm the environment, eliminate biodiversity, destroy the climate, and degrade natural resources. For example, Machu Picchu is situated in the Tropical Andes, a large and biologically diverse region.

[26] Kelling, George L, and James Q Wilson. "Broken Windows." The Atlantic, Atlantic Media Company, 20 July 2020, www.theatlantic.com/magazine/archive/1982/03/broken-windows/304465/.

[27] Vecchio, Rick. "Machu Picchu Spared from UNESCO Endangered Sites List." Peru Travel Blog, 11 Sept. 2017, www.fertur-travel.com/blog/2015/machu-picchu-spared-from-unesco-endangered-sites-list/10709/.

[28] "HISTORIC SANCTUARY OF MACHU PICCHU." World Conservation Monitoring Centre, United Nations Environment Programme.

[29] "Outstanding Universal Value: WHY WAS MACHU PICCHU INSCRIBED AS A UNESCO WORLD HERITAGE SITE IN 1983?" Machu Picchu, www.machupicc.hu/outstanding-universal-value/.

Though Machu Picchu exemplifies how preservation leads to sustainability, the surrounding Andes show us what can happen if we don't act quickly to preserve a region. In addition to being home to a sixth of the plant life on Earth and thousands of species of animals, this region is also a popular place for logging, oil, and mining industries. The destruction of the Tropical Andes, both legal and illegal, has made it the most critically endangered biodiversity hotspot in the world.³⁰ Estimates suggest that only a quarter of the original vegetation in the area is still intact. Harming natural resources in this way destroys animal habitats and has negative effects on entire ecosystems.

This endangerment exemplifies how lack of preservation has consequences on sustainability. In addition to the threat on the environment and species living there, much of the world depends on the biodiversity of this region as a source for food and medicine.^{31, 32} Exports from this area such as fish, fruits, wild relatives of crop plants that offer genetic variation for deriving new varieties, and medicinal plants and animals are just a few of the important resources that are endangered by the destruction of the Andes. As a result, the lack of preservation has threatened the UN Sustainable Development Goals. Zero hunger, good health and well-being, sustainable cities and communities, responsible consumption and production, and life on land are all at risk because of the amount of logging and mining in the area. This area desperately needs preservation, and at this point, it may be too late. Had regions of the Tropical Andes been preserved, we could responsibly balance the use of the region for resources without endangering it this much. Moderate limits on resource extraction and additional efforts at replenishing vegetation are measures that could have steered the area away from ecological ruin. Preservation plays a critical role in upholding the SDGs, and this can be observed from the comparison of Machu Picchu and the area surrounding it. Machu Picchu experienced the benefits of preservations while the Andes that it is situated in exemplifies what happens if we act too late.

While there is currently no known life outside of Earth, there are certainly useful assets, and failing to preserve heritage threatens the UN Sustainable Development Goals in similar ways in space. We currently have no idea what life-changing resources and discoveries are waiting for us in space, but if we don't start preserving sites, we may never get the chance to find out.

Conclusion

Earth is filled with sites of incredible universal value: natural, human-made, historical, cultural. As a global community, we have come together to ensure the protection and preservation of these sites for the benefit of all humanity.

[30] Martinez-Gugerli, Kristen. "Biodiversity in the Tropical Andes: How It Is Being Threatened, Why We Should Care, and How We Can Fix It." *Panoramas*, 25 Sept. 2017, www.panoramas.pitt.edu/health-and-society/biodiversity-tropical-andes-how-it-being-threatened-why-we-should-care-and-how-we.

[31] See previous source

[32] NatureServe and EcoDecisión et. Al. "Ecosystem Profile - Tropical Andes Biodiversity Hotspot." *Critical Ecosystem Partnership Fund*, Mar. 2015, www.cepf.net/our-work/biodiversity-hotspots/tropical-andes.

In the coming years, as we venture further into space, we must also ensure that cultural heritage sites in this opening realm are protected. Not only does this emphasize their inherent value, but it provides a beneficial opportunity to establish legal framework and precedent in space in a way that is fair, equitable, and just for all people on Earth.

The United Nations is in a unique position to facilitate the discussions we must have in order to secure cultural heritage in space. Thus far, the UN's role of ensuring peace and prosperity for all humans has been entirely Earthbound, but now is the time when it must reach further to the moon, to space, in order to protect the rich cultural value of humanity.

As young people poised to enter the community of engineers, scientists, organizers, and policymakers who will pioneer the next age of space exploration, it is important that we play a role in driving the values we think most important to ethically explore, work, and live in space. The goal of space heritage preservation is far-reaching and challenging--there is no single policy or action that will achieve this at once. Rather, a commitment to continuous preservation is necessary, especially as human existence in space evolves with new technology and new goals.

Soon enough, we will inherit this role from you, and the burden of preservation will rest on our shoulders. Not so long after, we will pass it down to the next generation, who will pass it on again when their time comes. If we are to be the first custodians of humanity's rich cultural heritage in space, it is our responsibility to ensure we put due time, effort, and thought into creating fair and comprehensive space policy. This is just the first step, a small step. But as we've seen before, when it comes to humanity in space, sometimes one small step is all it takes.



ASTROSOCIOLOGY IN CONTEXT: UNDERSTANDING A NEW WORLDVIEW



STEVEN J DICK
AMERICAN ASTRONOMER AND AUTHOR

In the 17 years since Jim Pass wrote his inaugural essay on astrosociology,¹ the broader study of the human dimensions of outer space has blossomed into a recognizable field, or I should say many overlapping fields that have been tackled from many interdisciplinary directions. Here I will only mention a few areas that I have personally experienced in the context of NASA, astrobiology, Big History, and the expanding field of astroculture in which astrosociology may be situated.

While the societal dimension of spaceflight may seem an obvious area of concern for a space agency, even the NASA History Office (the locus of the humanities and social sciences within NASA), has most often focused on the “nuts and bolts” history of its many missions. This despite the fact that the National Aeronautics and Space Act of 1958 specifically mandates that NASA “provide for long-range studies of the potential benefits to be gained from, the opportunities for, and the problems involved in the utilization of aeronautical and space activities for peaceful and scientific purposes.” Hanging our hats on that official phraseology, during my time as NASA Chief Historian we inaugurated a series of books on the societal impact of spaceflight, the first one stemming from a conference on that subject in 2006 sponsored both by the NASA History Office and the National Air and Space Museum’s Division of Space History. That volume, involving more than 30 authors, addressed themes from the commercial, economic, and social impact of spaceflight to its culture and ideology. The resulting Proceedings was followed by an even wider-ranging book on *Cosmos and Culture: Cultural Evolution in a Cosmic Context*. That volume sought to integrate cultural evolution into cosmic evolution, discussing Big History, the intelligent universe, and a possible postbiological universe, among many other topics. Most recently NASA has published *Historical Studies in the Societal Impact of Spaceflight*. These volumes, freely accessible online at the NASA history website, incorporate astrosociology conceived in its broadest sense. The latter volume even includes a long essay from Jim Pass that lays out the relevance of the field to NASA.²

[1] Jim Pass, “The Definition and Relevance of Astrosociology in the Twenty-First Century,” http://www.astrosociology.com/Library/lessay/iessay_p1.pdf
http://astrosociology.org/Library/lessay/iessay_p2.pdf

[2] Steven J. Dick and Roger D. Launius, *Societal Impact of Spaceflight* (Washington, DC: NASA, 2007); Steven J. Dick and Mark Lupisella, *Cosmos and Culture: Cultural Evolution in a Cosmic Context* (Washington, DC: NASA, 2009), <https://history.nasa.gov/sp4801.pdf>; Steven J. Dick, *Historical Studies in the Societal Impact of Spaceflight* (Washington, DC: NASA, 2015);); https://www.nasa.gov/connect/ebooks/hist_culture_cosmos_detail.html, and https://www.nasa.gov/sites/default/files/atoms/files/historical-studies-societal-impact-spaceflight-ebook_tagged.pdf

The scope of the human dimensions of spaceflight and the impact of humans adopting a truly cosmic perspective are too broad to address in this short essay. So let me turn to one field in which I have been deeply involved, astrobiology, as an exemplar of the societal questions that are finally beginning to be addressed. That field studies the past, present and future of life on Earth and beyond. As such it encompasses questions about the origin and evolution of life in the universe, questions whose answers will have profound effects on society, whether philosophical, theological, or social. What are the implications of contact with intelligent life? Should we initiate messaging with ET (METI) rather than passively search with current programs (SETI), risking possible consequences such as Cixin Liu vividly describes in his *Three Body Problem* science fiction trilogy? Either way, who speaks for Earth? And what theories of moral status should we employ in our interactions? (They had better be more biocentric, ecocentric, or cosmocentric rather than anthropocentric, or we are asking for trouble). Even if “only” microbial life is discovered beyond Earth, how do we deal with that scenario? Should Martian microbes be left alone or used for pharmaceuticals, as they have been with some of the extremophile microorganisms found on Earth? Is it morally defensible to terraform Mars if microbial life exists there? I have detailed some of these questions in my recent book *Astrobiology, Discovery, and Societal Impact*.³ As in Liu’s *The Three Body Problem*, Carl Sagan’s *Contact*, the movie *Arrival*, and many others, these themes are popularized in science fiction film and literature, which in my view is one method that society attempts to assimilate the new worldview that a cosmic perspective entails. The UFO phenomena is another symptom, where the need for psychological, sociological and scientific study is all too evident.

Though astrobiology is far from solely a NASA endeavor, NASA has led the way in societal impact studies in this field with the inauguration in 2012 of the Baruch S. Blumberg NASA/Library of Congress Chair in Astrobiology, specifically geared to studying the “humanistic” aspects of astrobiology. During the first decade of its existence this prestigious Chair has been held by two astronomers, three historians of science, a journalist, a theologian, and a professor of literature. Though a sociologist has not yet been appointed, the Chair, which has recently added “exploration and innovation” to its title, is certainly open to the broader social sciences. An indication of its scope is that the books and articles emerging from this endeavor range from the meaning of the Anthropocene to the impact of discovering life beyond Earth and ethical considerations of Mars exploration.⁴ And while NASA has historically and sporadically engaged societal aspects of astrobiology dating back to its Cultural Aspects of SETI (CASETI) workshops in the early 1990s, Table 1 shows that many other organizations have also tackled the subject. The European Astrobiological Society (EAS) and the relatively new Society for the Social and Conceptual Issues in Astrobiology (SSoCIA) have philosophical, theological, and sociological aspects as an important focus.⁵

[3] Steven J. Dick, *Astrobiology, Discovery, and Societal Impact* (Cambridge: Cambridge University Press, 2018)

[4] David Grinspoon, *Earth in Human Hands* (New York: Grand Central Publishing, 2016); Steven J. Dick, ed., *The Impact of Discovering Life Beyond Earth* (Cambridge U. Press, 2015), and Dick (2018).

Meeting	Date and Place	Sponsor	Results
Cultural Aspects of SETI (CASETI)	1991-1992 Chaminade Conference Center, Santa Cruz, California	NASA	John Billingham et al., eds., <i>Social Implications of the Detection of an Extraterrestrial Civilization</i> (1999)
Many Worlds	November 22-24, 1998 Lyford Key, Nassau, The Bahamas	John Templeton Foundation	Steven Dick, ed., <i>Many Worlds: The New Universe, Extraterrestrial Life, and the Theological Implications</i> (2000)
When SETI Succeeds	1999 Hapuna Prince Big Island of Hawaii	Foundation for the Future	Allen Tough, ed., <i>When SETI Succeeds: The Impact of High-Information Contact</i> (2000)
Societal Implications of Astrobiology Workshop	November 16-17, 1999 NASA Ames	NASA	Albert Harrison et al, eds <i>Workshop on the Societal Implications of Astrobiology</i> (1999)
Exploring the Origin, Extent and Future of Life	2003 American Association for Advancement of Science Washington, DC	NASA/ American Association for the Advancement of Science	Constance Bertka, ed., <i>Exploring the Origin, Extent and Future of Life</i> (2009)
Astrobiology: Expanding our Views of Society and Self	May 2008 Univ. of Arizona Biosphere 2 Institute	University of Arizona	Chris Impey et al, eds. <i>Encountering Life in the Universe</i> (2013)
Astrobiology and Society	February 2009 SETI Institute	NASA Astrobiology Institute	Margaret Race et al., "Astrobiology and Society," <i>Astrobiology</i> , 12 (2012), pp. 958-965
The Detection of Extraterrestrial Life and the Consequences for Science and Society Satellite Meeting	25-26 January, 2010 Royal Society in London Kavli Centre Buckinghamshire	Royal Society of London	Dominik and Zarneki, eds., <i>Philosophical Transaction of the Royal Society of London A</i> , vol. 369, issue 1936 (2011)
The History and Philosophy of Astrobiology	September 27-28, 2011, Ven, Sweden	Pufendorf Institute for Advanced Studies, Lund University, Sweden	David Duner et al., <i>Astrobiology</i> special issue, vol. 12 (2012); David Duner, ed., <i>The History and Philosophy of Astrobiology</i>
Preparing for Discovery	September, 2014 Library of Congress	NASA/Library of Congress	Steven Dick, ed. <i>The Impact of Discovering Life Beyond Earth</i> (2015)
Social and Conceptual Issues in Astrobiology 2016	September, 2016 Clemson University	Clemson University	Kelly Smith, <i>Social and Conceptual Issues in Astrobiology</i> , in press
Social and Conceptual Issues in Astrobiology 2018	April, 2018 University of Nevada, Reno	University of Nevada, Reno; Blue Marble Institute; others	Ted Peters (Ed.) <i>Science and Theology</i> special issue, Vol 17 (2019); Kelly Smith and Keith Abney (Eds.) <i>Futures</i> special issue, in press

Table 1. Discussions on Societal Impact of Astrobiology, 1991-2019
Adapted from: Steven J. Dick, *Astrobiology, Discovery, and Societal Impact* (Cambridge University Press, 2018)

Astrobiology is only one small part of the human dimensions of spaceflight, giving rise to a new worldview that I have termed the “Biological Universe.” But it is an indication of the kinds of studies that need to be undertaken in the much broader field of spaceflight that is giving rise to an even more all-encompassing worldview, one that might be called “Interstellar Humanity” that places humans in the context of the universe.⁶ We are more and more immersed in astroculture, and the study of this culture only becomes more urgent as we transform into an increasingly spacefaring species. Astrosociology itself is a manifestation of astroculture, which refers both to the culture itself and to the new field of inquiry that analyzes how humans have, and will, come to terms with the universe of which we are a part. Several books and conferences have been devoted to this theme, to wide applause from the space community.⁷ The relationship of humans and the cosmos emphasized in astroculture also resonates with the new field of Big History, which highlights humanity’s place in 13.8 billion years of cosmic evolution. Though humanity is certainly not the purpose or endpoint of that evolution, it is part and parcel of it.⁸

The awakening cosmic consciousness that gave rise to astrobiology, astrosociology and astroculture is now giving rise to other new fields such as astrotheology.⁹ The study of humanity’s place in the universe becomes more and more urgent, and the social sciences must play an essential role. Its practitioners must engage not only through passive studies, but also as active participants in all the myriad humanistic issues of spaceflight. My fondest hope is that in the case of events such as contact with extraterrestrial intelligence, astrosociologists, astrotheologians, anthropologists, historians, and social scientists in general will play an important role in fostering and understanding the resulting new worldviews.

[5] <https://europeanastrobiology.eu>, and K. A. Kapova et al, “Astrobiology and Society in Europe Today,” <https://europeanastrobiology.eu/onewebmedia/PREPRINT%202018%20Astrobiology%20and%20Society%20in%20Europe.pdf>. Kelly Smith and Carlos Mariscal, eds. *Social and Conceptual Issues in Astrobiology* (Oxford: Oxford University Press, 2020).

[6] Steven J. Dick, *The Biological Universe: The Twentieth Century Extraterrestrial Life Debate and the Limits of Science* (Cambridge: Cambridge University Press, 1996); Dick, “Interstellar Humanity,” *Futures*, 32 (2000), 555-567, reprinted in Dick, *Space, Time, and Aliens: Collected Works on Cosmos and Culture* (Switzerland: Springer, 2020).

[7] Alexander T. Geppert, ed., *Imagining Outer Space: European Astroculture in the Twentieth Century*, (New York: Palgrave-MacMillan, 2012); Geppert, *Limiting Outer Space: Astroculture After Apollo* (London: Palgrave Macmillan, 2018); Geppert, *Militarizing Outer Space: Astroculture, Dystopia and the Cold War* (London: Palgrave Macmillan, 2020)

[8] David Christian, *‘Maps of Time’: An Introduction to ‘Big History’* (Berkeley, CA: University of California Press, 2004); Fred Spier, *The Structure of Big History: From the Big Bang Until Today* (Amsterdam: Amsterdam University Press, 1996).

[9] Ted Peters, ed. *Astrotheology: Science and Theology Meet Extraterrestrial Life* (Eugene, Oregon: Wipf and Stock, Cascade Books, 2018).

THE ARTIST'S PURPOSE AS AN INTEGRANT PART OF THE INTELLECTUAL ROCKET AND SPACE EXPLORATION



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"Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world." - Albert Einstein

I often think of the purpose of imagination in our lives and its impact on the evolution of humanity. Having the soul of an artist, I like to create images of different ideas. Speaking of imagination, I picture it as a cosmic cylinder in which a cosmic language and knowledge of the universe is reversed to humanity through the unconsciousness and the intuition of an artist. I imagine the universe as a conscious entity that expresses itself inwardly, on earth and other physical planets and its beings, through the various talents of humans and other beings.

In today's context when the sky is no longer the limit, I strongly believe that an artist's imagination can significantly propel humanity to a new level of space exploration when considering the above statement by Albert Einstein. The artists have tremendous importance in space exploration and the artist's special abilities to tap into hidden information from the universe should be explored with great seriousness. Through the exploration of the imagination, humanity can attain new knowledge that can be used by STEM (Science, technology, engineering, and mathematics) (science, technology, engineering, mathematics) disciplines to develop new ways of physical space exploration. To achieve this common goal, each of the main disciplines involved in space exploration, STEM, social science, and natural science need to be interconnected solidly in a collaborative way. Speaking of these discipline's unity, I strongly support the astrosociology field that encompasses and binds all the disciplines involved in outer space research including the art field, forming a mastermind for humanity and its greater goal for exploring the vastness of the universe.

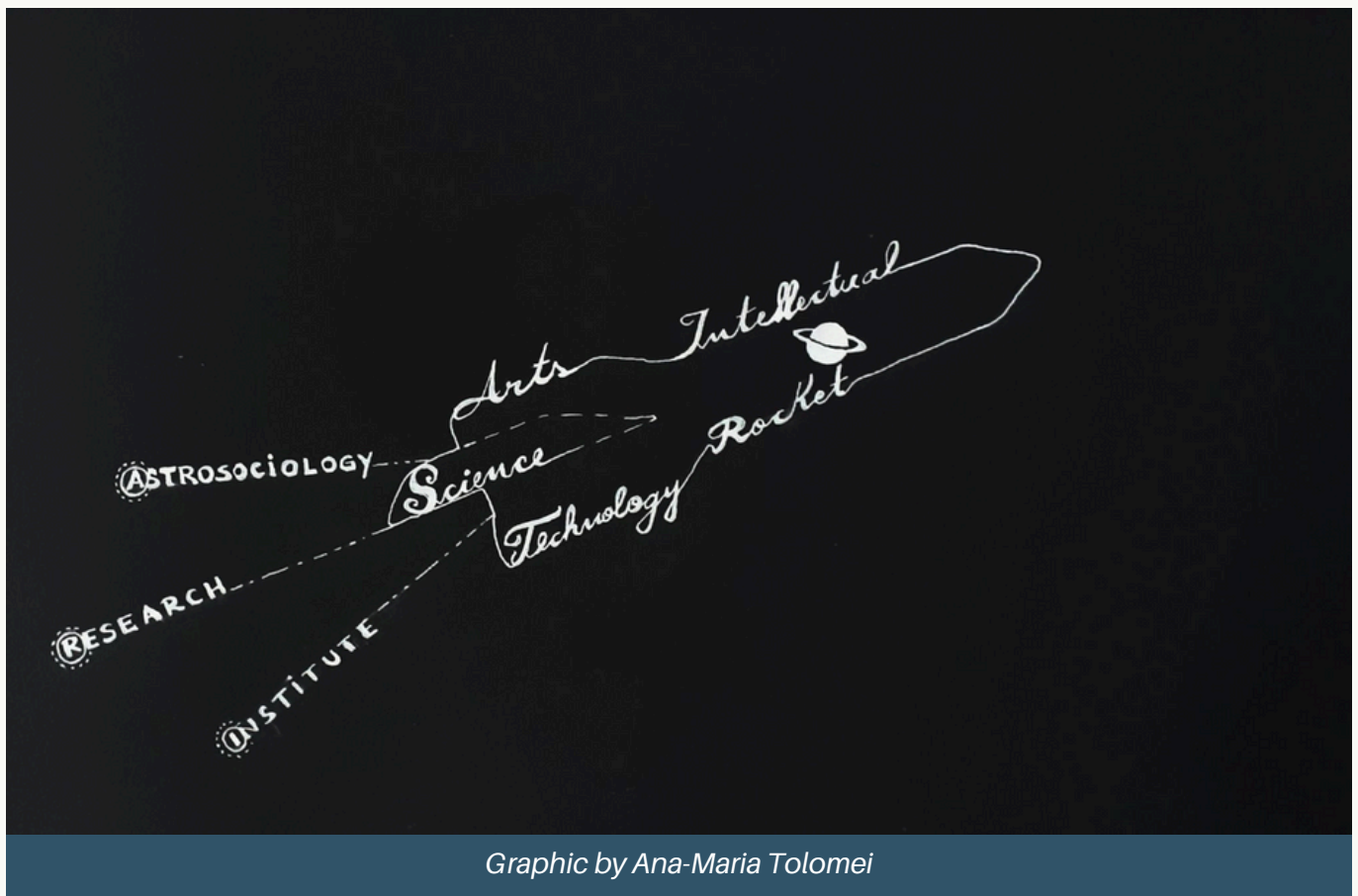
Being part of this mastermind, an artist plays an essential role in capturing a piece of information from outer space and forming a language of expression for it. Let's think of this as a triad, and as a first step in exploring outer space, followed by the action of the rest of the team and the process of decoding these languages or images by other experts from social and natural science fields. The second step explored by the experts in these fields is to find a logical and practical purpose of these languages and images and validate it as a worthy subject for further research. A balanced collaboration is needed, as that of a Venn diagram with interconnected circles or as the flower of life pattern that expands in the research process.

This pattern has been followed naturally throughout human history hence the advancement of human civilization today, a pattern that seems to look like a human's cross-section DNA, composed of seven overlapping circles that build outward and which forms a flower-like pattern said to be the basic template for everything in existence, which has been used since ancient times in many cultures around the world.

Humanity should expand the circles of this flower of life and focus on creating an intellectual rocket with its base as a triad of intellectual masterminds comprising of (1) active imagination group that encompasses all forms of arts as defined by Carl Jung, (2) science group that can decode all these forms of art expressions, and (3) the technology, engineering, quantum physics group, etc that can be responsible for restructuring the decoded messages into new ways of space exploration and tools that can serve the purpose for this incredible common goal.

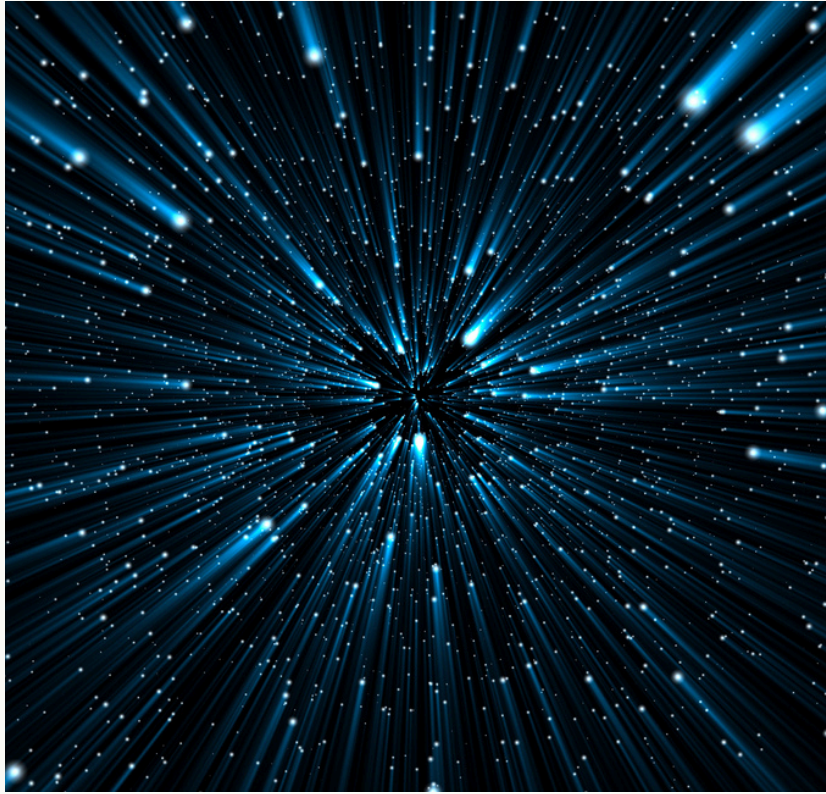
I will conclude this text with a quote from Leonardo Da Vinci who indicated a profound interdependency of the art and science disciplines:

"To develop a complete mind, study the science of art; study the art of science. Learn how to see! Realize that everything connects with everything else."



Graphic by Ana-Maria Tolomei

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The Astrosociology Research Institute (ARI) is a California nonprofit public benefit educational corporation dedicated to the development of astrosociology as a multidisciplinary academic field.

Its mission includes providing assistance to individuals and organizations that choose to pursue ARI's mission as stated on the home page of this site. Its mission emphasizes assistance to students conducting astrosociological study and original research.

ARI is the original 501(c)(3) organization dedicated to the development of astrosociology as an accepted field in academia and to cutting-edge astrosociological research.

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