ASTROSOCIOLOGY AND INEQUALITY IN GLOBAL SPACE GOVERNANCE

by

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ABSTRACT

The introduction of the field of astrosociology in 2004 by author Pass focuses on the study of *astrosocial phenomena* (that is, social, cultural, and behavioral patterns related to outer space). As such, astrosociology exists as a multidisciplinary field to fill a vacuum that covers several space-related subfields from social and behavioral science as well as humanities perspectives, including many issues related to *global space governance*. For this reason, this paper centres on four specific related areas focusing on the divergent interests and social inequality among nations that involve dominant and subordinate voices in global space policymaking, and the enactment and enforcement of global legal regimes/international law:

(1) The impact of cooperation and conflict among nations on global space governance.
(2) The participation of developing nations and their prevention from participating.
(3) Settling differences between developing and developed nations.
(4) The roles of pre-space-capable nations in global space governance.

Although *de jure* equality does exist among nations, *de facto* equality does not. Thus, many questions arise. How do nations of different levels of political and economic power interact on the global stage? How should

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they do so in the future? What roles do pre-space-capable nations play? What are some of the major areas of cooperation and conflict regarding the future of the space global commons? This paper addresses these and related issues involving the shaping of global space governance as nations experience ongoing social and cultural change with a strong emphasis on the issues involving inequalities among them.

I. INTRODUCTION

Open and equal access to space is the cornerstone of the social compact underlying space activities.[1] However, such decrees do not reflect the social and cultural realities experienced in the real world. Addressing the problems of global space governance will only grow greater in importance as additional nation-states[2] and commercial actors continue to cultivate their space activities. As space activities grow and evolve, we can expect greater issues to arise that affect how social groups organise such activities and deal with the externalities that develop from complex social interactions in space. The complexities multiply as humans seek to migrate off Earth and create ecologies to support human habitation in other space environments.[3] At each step, astrosociology seeks to understand how astrosocial phenomena develop and affect the development of social groups in space environments and ecologies, and on Earth. However, the starting point for these investigations necessarily begins on Earth and acknowledging that not all social groups have the ability to take advantage of the open and equal access to space. While space may be open to all social groups in principal, inequalities among social groups certainly have precluded participation in space activities relative to other social groups. The differences between social groups, when sampled across a variety of quantitative and qualitative variables, could have a measurable impact on how future social groups develop and pursue (or do not pursue) the remediation of problems of global space governance. This paper thus seeks to develop a framework to study the effects of inequality in global space governance from an astrosociological perspective and identify such variables for further study.

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[1] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, 27 January 1967, 610 UNTS 205, 18 UST 2410, TIAS No 6347, 6 ILM 386 (entered into force on 10 October 1967) [Outer Space Treaty], art 1.

[2] Throughout this paper, we will use this term interchangeably with its disjunctive meaning, i.e., "nation," meaning a large group of people with shared social organization and traits, and "State," meaning a legally organised and recognized social entity.

[3] Christopher Hearsey & Jim Pass, "The Astrosociological Paradigm: The Interplay between Ecologies and Environments", paper delivered to the 50th (2011) AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition, Nashville, TN, online: Aerospace Research Central, American Institute of Aeronautics and Astronautics <http://arc.aiaa.org/doi/abs/10.2514/6.2012-201>.

II. AN OUTLINE OF ASTROSOCIAL DYNAMICS IN GLOBAL SPACE GOVERNANCE

A. ASTROSOCIOLOGY'S MEANING AND SCOPE

Since astrosociology is the study of astrosocial phenomena – the social, cultural, and behavioral patterns related to outer space[4], this field includes a wide variety of pertinent variables that relate precisely to global space governance on a number of different levels.

> The social component includes social interactions, group dynamics, societal issues, and interactions among nations. Cultural elements include norms, physical manifestations known as "material culture," ideas – and thus values – and subcultures. The behavioral component adds phenomena that focus on the individual involving mental processes and resulting behavior.[5]

These patterns consist of a combination of elements involving both space phenomena and humans, including their societies, social groups, and cultures. The significance of this is that the human dimension of space exploration trumps other considerations for astrosociologists. The definition of astrosociology is important because it brings to bear a long history of all of the social-scientific theories and perspectives, research findings, traditions, methodologies, and synergies into a single field focusing solely on the relationship between humanity, and its societies, and outer space. Furthermore, astrosociology studies space-related issues on the macro, meso or middle, and micro levels of analysis that range from interactions among nations to those among individuals.

As a pre-condition, astrosociologists do not necessarily assume that outer space will change how social relationships form among humans. Astrosociology only provides the analytic tools to measure how social relationships may or may not form among humans in space and/or on Earth through a holistic approach by identifying important, but often-overlooked, variables at the nexus of the hard and soft sciences.[6] Moreover, astrosociologists make no claims with respect to general social-scientific theses and investigations at an Earth-centric scale. However, such theses and investigations do necessarily inform astrosociology. To be clear, astrosociology is only concerned with theorising and investigating how the outer space environment and ecologies may or may not affect

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[4] Jim Pass, *Pioneers on the Astrosociological Frontier: Introduction to the First Symposium on Astrosociology*, paper published in proceedings at the 1st Symposium of Astrosociology that was part of the 2009 Space Propulsion, and Energy Sciences International Forum held in Huntsville, Alabama.

[5] Pass (2009) at 4.

[6] Most efforts during the space age have relied on what we now commonly refer to as the STEM fields and disciplines, which consists of the so-called "hard" sciences, technology, engineering, and mathematics. The problem with such a focus is that it downplays the human dimension, which is the realm of the social and behavioral sciences, and the humanities; that is, astrosociology. Global space governance is a complex area of study that requires a multidisciplinary approach such as offered by the field of astrosociology.

social relationships. As such, astrosociologists look at the astrosocial dynamics at the interplay between social entities affected by space environments and the ecologies they support, and the influence space has on humans on Earth. Evidence continues to grow, supporting the thesis that space environments, and those giving rise to space ecologies, have influenced and continue to influence astrosocial dynamics (i.e., the social, cultural, and behavioral patterns of the human species on Earth).[7] Therefore, the study of astrosocial phenomena is important to understanding how space affects humanity and why humans may or may not view space as even governable.

Insofar as this paper is concerned, we have scoped this study of inequality within the global space governance theme to what astrosociology can evaluate. These authors argue that while researchers have identified many problems of global space governance over the years, few multi-disciplinary analytic tools exist to evaluate the totality of specifically astrosocial issues that are inherent to global space governance from a truly social-scientific perspective. Astrosociology and its attendant subfields provide an analytic framework to evaluate astrosocial phenomena inherent in space activities and the governance of such activities.[8]

B. GLOBAL GOVERNANCE AND INEQUALITY

The World Health Organization (WHO) defines "governance" as:

> …the different ways that organizations, institutions, businesses, and governments manage their affairs. Governance is the act of governing, and thus involves the application of laws and regulations, but also of customs, ethical standards and norms. Good governance means that affairs are managed well, not that the laws, regulations or norms are themselves necessarily "good." [9]

G*lobal space governance* is thus "the application of the "rules" – both legally

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[7] The Overview Effect is a great example that demonstrates how space affects terrestrial societies and social movements, including the environmental movement, not to mention the impact of space exploration on the public. See the Overview Institute, "Declaration of Vision and Principles", online: Overview Institute <http://www.overviewinstitute.org/about-us/declaration-of-vision-and-principles>. NASA has pointed out the need to understand the impact of space exploration in the past:

> The consequences of space exploration as already undertaken stand before us for examination. They occur on many levels: commercial applications, education and inspiration to youth, applications satellites, scientific benefits, and philosophical implications. All are open to analysis, and as we approach the fiftieth anniversary of the Age of Space, we should examine, with historical objectivity, precisely what the impact of the Age of Space has been.

See NASA, "Why we explore? Societal Impact of the Space Age" , online: NASA <http://www.nasa.gov/exploration/whyweexplore/Why_We_09.html>.

[8] Jim Pass, Christopher Hearsey, & Simone Caroti, "Refining the Definition of Astrosociology Utilizing Three Perspectives", paper delivered to the AIAA Space 2010 Conference and Exposition, Anaheim, CA, online: Aerospace Research Central, American Institute of Aeronautics and Astronautics <http://arc.aiaa.org/doi/abs/10.2514/6.2010-8656>.

[9] See website page of the World Health Organization on "Global Governance", online: WHO <http://www.who.int/trade/glossary/story038/en/>.

binding and customary – which relate to the global management of [space] issues".[10] Using this definition of global space governance along with the concept of astrosociology, one may argue that it refers to the applications of the rules that relate to the global management of space issues. However, this discussion focuses on those space issues that relate to inequality among nations and other entities that affect their various roles in the governance of space issues.

Moreover, global space governance refers to a system of ordering actors and activities into social relationships with one another within the bounds of space activities and their governance. Social horizontal and vertical orderings are formed from these social relationships and produce organisation relative to an actor's legal status, resources, and capacity. For example, States order themselves as States and follow the norm of sovereign equality, but not every State is equal in resources and capacity. A State may have the capacity to engage in the regulation of space activities, but lack the indigenous capabilities for spaceflight or rely on the spaceflight capabilities of another State. Furthermore, when States order themselves into international institutions, for example, they create vertical orderings amongst themselves. Within such vertical orderings, States may have sovereign equality depending on the nature of the ordering, but again, may lack any congruencies in resources and capacity.

States are not the only actors within the entire system of space activities. Natural and juridical persons, unrecognised States, and international organisations may also order themselves hierarchically within the complete set of actors producing inequities in global space governance. Their social influences can be co-dependent with those of State actors. For example, trade unions like the Commercial Spaceflight Federation or private legal institutions like the International Institute of Space Law may not have the legal status, resources, or capacity of a State, but each has the ability to influence State decision-making and industrial policy through the dissemination of their expertise on a variety of subjects. Nevertheless, having the ability to offer expertise and skills does not always translate into effective influence – that is a different measure all together – and we do not seek to make any such conclusions here.

Differentials in legal status, resources, and capacity give rise to a system that is inherently unequal. In the context of global space governance, inequality refers to the varying resources and capacity available to the various actors to manage space affairs; that is, it refers to how much influence various actors have over how space management is conducted within a particular ordering (horizontal and/or vertical). Thus, while all actors may possess *de jure* equality relative to other actors' positions across respective horizontal orders, *de facto* inequality exists among actors across horizontal and vertical orders because of the relative distribution of resources and capacity. Such a system may or may not be judged normatively deficient, but we make no claims here regarding any normative designation of good or bad. Instead, we seek to understand

[10] *Ibid.*

how actors order themselves within a system of space activities and identify important and determinative variables that describe the type(s) of governance system(s) that could emerge out of an inherently unequal system. For whatever utility, however, global space governance is an important goal to achieve, if only to ensure a stable continuation of our species in outer space.

C. ASTROSOCIAL DYNAMICS IN THE CONTEXT OF GLOBAL SPACE GOVERNANCE

Evaluating the future of the human species involves the investigation of trending increases and decreases in space exploration/exploitation and the migration to space environments. For centuries, humankind has organised itself into a large number of nation-states that have and have not shared in some common interests, as well as divergent interests, relative to other organised social groups. Over time, most, if not all, social relationships are prone to change undergoing modifications, dissolutions, and the creation of new relationships and associations. Moreover, ongoing social and cultural changes can have significant effects on the organisation of social relationships among and within nations, which manifest in a myriad of complex and often unanticipated ways.

Our shared experiences on Earth tell us that cultures and nation-states develop in line with a number of different social realities, which include, *inter alia*, security interests,[11] level of technological and scientific advancement,[12] level of political and economic power,[13] the nature and evolution of cultural identities,[14] and developmental ordering in relation to other nation states (Wallerstein, 1974).[15] Such differences result in relationships that can make even global space governance on a cis-lunar scale difficult to implement.[16] States with sophisticated space knowledge and experience tend to be less likely to share their scientific, technological, or industrial secrets due to the belief, for example, that it would compromise their security too greatly.[17] Moreover, the ordering of rules

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[11] See Nancy Gallagher, "Space Governance and International Cooperation" (2010) 8:2-3 Astropolitics 256.

[12] Jim Pass, "Inaugural Essay: The Definition and Relevance of Astrosociology in the Twenty-First Century (Part One: Definition, Theory and Scope), online: Astrologysociology Research Institute <http://www.astrosociology.org/library/iessay/iessay_p1.pdf>.

[13] Immanuel Wallerstein, *The Modern World System: Capitalist Agriculture and the Origins of the European World Economy in the Sixteenth Century* (New York: Academic Press, 1974).

[14] Jonathan Friedman, *Cultural Identity & Global Process* (Thousand Oaks, CA: Sage Publications, Inc., 1994).

[15] *Supra* note 13.

[16] Multi-dimensional social and cultural variables such as these create in-groups and out-groups at different levels of analysis. Different and even conflicting values among social groups and nations create challenges to cooperation that require dedicated parties to overcome. Furthermore, the difficulties of implementing space governance policies within and among terrestrial nations lend credence to the likelihood of potentially greater problems in more frontier-oriented space environments.

[17] Present day examples: the International Traffic in Arms Regulations (ITAR) in the United States, Export Control rules in general. Historical examples: optical glass in Bavaria, Oxen during the early history of the US.

and the development of institutions for protecting and regulating space technologies is much easier to invest in and implement at the national level than it is at the international level.[18] Consequently, these issues raise important concerns in terms of inequality, competition and conflict, cooperation and coordination, and the governance problems generally underlying space activities. The goal of studying these issues is a means by which to evaluate progress, identify hidden problems, and explore the possibility of future ones.

Since space technologies require a high level of technological competence, only those actors with indigenous capabilities or resources to procure such capabilities have equity in the development of such governance structures. For example, only United Nations (UN) Member States that have developed or put forth significant resources to create an indigenous space industry become members of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOUPOS).[19] From a practical point of view, this makes sense. Even with the narrowest of space technological policies or capabilities, States can elevate themselves to work with other similarly situated States in the development of rules for space activities and engage in the exchange of ideas on the uses of space technologies. Without such technological capabilities or intentions, space-interested States would have little incentive to spend time dealing with non-space-capable or uninterested States.

Additionally, cultural factors may also function to select out space interested or capable States from participation in space activities, rule development, or governance. For example, elements within a culture may develop new norms or prohibitions on space travel.[20] Other social groups may band together to prohibit the transfer of necessary technologies for spaceflight from one member to another or make binding rules to prevent access to space by a particular social group.[21] Furthermore, not all cultures see access to space in the same way and thus may punish or prohibit others within their sphere of influence for attempting to access technologies or resources to go to Earth orbit and beyond.

When technologies proliferate and effect social orderings, then actors, with an interest in the governance of such technologies, tend to arise and create governance structures to regulate the use of such

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[18] Social subcultures within a single society can, and do, produce conflict even within a shared larger culture. Interactions among actors from nations with very different norms and values share fewer agreed-upon elements of their worldviews, and thus cooperation becomes even more difficult. The global stage represents an environment in which very unique actors attempt to put in place shared policies in a very diverse human civilisation.

[19] See the UNCOPUOS website, online: United Nations Office for Outer Space Affairs <http://www.oosa.unvienna.org/oosa/COPUOS/copuos.html>.

[20] A good example is the Fatwa against going to Mars, see Per Liljas, " Islamic Watchdog Issues Fatwa Against Joining Mission to Mars", *Time* (27 February 2014), online: Time <http://world.time.com/2014/02/27/islamic-watchdog-issues-fatwa-against-joining-the-mission-to-mars/>.

[21] Examples include the Missile Technology Control Regime, ITAR, and the United Nations Security Council resolution on North Korean rocket testing, see UNSC Resolution 1874 (2009).

technologies.[22] An increase in technological maturity and a technology's social utility gives rise to more complex problems that one may deem addressable through coordination. Coordination can manifest itself through formal and informal means. An apropos example of this is the social orderings and governance structures created by the Chicago Convention of 1944.[23]

The Chicago Convention[24] created a legal and governance system for international air travel administered by the International Civil Aviation Organization (ICAO).[25] With the proliferation of aviation technologies and the growth of social demand in international air travel, parties to the Chicago Convention sought to address problems of global aviation governance through the establishment of rules and the creation of an international institution to handle common problems of international air travel. Since 1945, international air travel has become relatively standardised. Vertical orderings of governance operate between ICAO and state aviation authorities, e.g., through the issuance and implementation of ICAO issued standards and recommended practices (SARPs) to state aviation authorities.[26] Horizontal orderings of governance operate between and among state aviation authorities, e.g., aircraft certification agreements between the United States' Federal Aviation Administration (FAA) and the United Kingdom's Civil Aviation Authority (CAA).[27] Cross-sectional integration developed from the interactions of national and international organisations, e.g., through the development of trade associations like the International Air Transport Association (IATA), which supports airline industrial policies and standards. Each example is but an embedded microcosm of governance structures relative to the various scales with which governance of international air travel arises. The degree to which this system is effective and/or efficient for stakeholders may vary, but it is hard to deny the utility of these types of governance structures to meet the goals and objectives of interested actors.

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[22] The fact that structural social transformations and the changes of cultural ideas occur in every society on Earth means that space activities evolve with the advancement of science and technology, and thus new policies to regulate them must also occur after their creation and/or implementation. The creation of new technologies may bring about cooperation and coordination when the interests of various actors coincide and therefore trump any disagreements that may exist. For example, see the Apollo-Soyuz mission, Ezell, Edward Clinton, and Ezell, Linda Neuman. The Partnership: A History of the Apollo-Soyuz Test Project. NASA SP-4209, 1978.

[23] See WM Sheehan, "Comment: Air Cabotage and the Chicago Convention," (1950) 63(7) Harvard Law Review 1157.

[24] *Convention on International Civil Aviation*, 7 December 1944, 15 UNTS 295, ICAO Doc 7300/6 (entered into force 4 April 1947) [*Chicago Convention*].

[25] David Mackenzie, *ICAO: A History of the International Civil Aviation Organization* (Toronto: University of Toronto Press, Inc., 2010).

[26] Michael Milde, *International Air Law and the ICAO* (Utrecht: Eleven International Publishing, 2008).

[27] See the FAA Air Certification Bilateral Agreements page, online: FAA <http://www.faa.gov/aircraft/air_cert/ international/bilateral_agreements>.

Regardless, the use and proliferation of aviation technologies, much like space technologies, led to the social ordering of such activities among interested actors and the creation of governance structures in the regulation of aviation technologies and their use. While such orderings are not teleologically determinative, an observer can certainly make predictions about whether particular social orderings will arise and produce governance structures. The degrees of horizontal and vertical orderings of governance structures (i.e., those actors that facilitate the ability for social entities to govern a particular activity at a particular social order), continue to evolve despite the growth of issues that strain the governance frameworks under which such structures operate.[28] Where no governance or coordination exists, can we make predictions that interested actors will coordinate to develop governance structures? Yes, if the theory underlying the prediction is sound and we account for determinative variables. This requires a good understanding of the underlying astrosocial dynamics between actors (i.e., accounting for the social, cultural, and behavioral patterns influencing how humans order themselves regarding space activities).

As in most, if not all, social activities, rules and enforcement of rules provide social stability within social groups. When social activities give rise to externalities that endanger social stability, the governance of such activities becomes an important tool to mitigate negative externalities or ensure the status quo. The development of governance structures, however, may give rise to interest balancing, cost-benefit analysis, band-wagoning, or some other tangible or intangible form of utilising individual or group power (Al-Rodhan, 2012).[29] The need to maintain social stability and the need to progress individual or group interests may not always be congruent. Conducting activities in outer space and the need to maintain its utility necessarily gives rise to externalities that can endanger social stability. Astrosociologists thus study these issues simply because space issues affect societies on a number of different levels.

Moreover, global space governance is difficult even when conditions are favourable, but inequality can place greater difficulties on cooperative ventures. The fact that space governance on a global scale can help mitigate ongoing serious problems is no guarantee that cooperation will occur to some desired utility. An important task hinges on identifying governance policies that achieve a desired utility as opposed to those that dissolve social ordering as well as working to identify those important variables that influence governance one way or the other. As one commentator put it,

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[28] Anne-Marie Slaughter, *A New World Order* (Princeton, NJ: Princeton University Press, 2004).

[29] The unilateral use of power undermines space policymaking among actors from differing States, as it is based on national interests that are often at odds with those from other States. Such situations can lead to mistrust, which tends to undermine cooperative objectives and goals that may be on the agenda. See Nayef RF Al-Rodhan, *Meta-Geopolitics of Outer Space: An Analysis of Space Power, Security, and Governance* (New York: Palgrave Macmillan, 2012).

> [a]ll nations are increasingly reliant on space, not only when disasters strike, but also for our day-to-day life. We need to protect and preserve our long-term interests by considering the risks that could harm the space environment and disrupt services on which the international community depends.[30]

While certainly a broad statement of fact and human aspiration, comments like these tend to proliferate within a variety of literatures. Such comments suggest the importance of rules and enforcement of rules to provide social stability in the governance of space activities, but fail to account for which groups' interests will be considered resulting in their potential benefit at the cost of other social groups. Inequality in legal status, resources, and capabilities loom large in the background of the issues underlying global space governance. However, how we group social actors together and account for their varied abilities and interests will give us a greater picture that explains astrosocial dynamics and the probable formation of governance structures for the regulation and prioritising of space activities.

III. THE NATURE OF THE INEQUALITY PROBLEM FROM AN ASTROSOCIOLOGICAL PERSPECTIVE

Social relationships exist among actors of various types, from individuals to nations, despite differences in development levels. However, the needs of space-capable nations do not always fall in line with the best interests of pre-space-capable nations. We observe inequality among more developed States because not all States can be exactly equal in resources and capabilities. Moreover, each possesses their own unique combination of national security and cultural interests, which places limitations on the types of cooperative space agreements possible to achieve global space governance. The problem from an astrosociological perspective is the very fact that – however one measures it – there is a class-type system among nations at the international level. Multiple ancillary problems arise from this fact including difficulties in constructing complementary space policies at the global level. Tracking the differential aspects of space-interested actors allows for the evaluation of shifts in relative position among space-interested actors, whether in legal status, resources, or capacity. The ability to exercise legal status, resources, and capabilities necessarily gives rise to a discussion of the use of power. Below, and in the next section, we attempt to identify and comment on those astrosocial variables important to the categorisation of space-interested actors, tracking changes in relationships, resources, and capacity among space-interested actors. Additionally, we attempt to identify such qualitative variables as cultural and social narratives that give life to space activities in the utility of the use of power within social orders.

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[30] Jeffrey Eberhardt, "Remarks by Jeffrey L. Eberhardt, Alternate Representative, U.S. First Committee Delegation, at the Thematic Discussion on Outer Space (Disarmament Aspects), New York, NY, October 25, 2013", online: United States Mission to the United Nations <http://usun.state.gov/briefing/statements/215961.htm>.

A. SOCIAL-SCIENTIFIC ORIGINS OF THE INEQUALITY PROBLEM

From a sociological perspective, social inequality refers to a stratification system in which two or more parts possess unequal access to resources such as power, prestige, and authority. Simply stated, sociologist Max Weber defined power as the ability of an actor to carry out his, her, or its will despite resistance.[31] Within a single society, this hierarchy of power can occur among social classes or categories of individuals, for example. In the present case, the inequality exists among nations. From an astrosociological perspective, the focus becomes the hierarchy of nations in relation to their relative positions in the practice of global space governance. Some nations possess more of the types of resources that provide them with greater amounts of power and prestige, for example, which places them in superior positions within the hierarchy. These more powerful nations have the greatest ability to impose their values and enforce their types of norms in ways that shape global governance to their advantage. Space-capable nations can launch spacecraft into low Earth orbit, of course, but they also possess resources, both intellectual and tangible, that less developed nations generally lack.

Furthermore, Immanuel Wallerstein's World System Theory, which developed as an alternative to modernisation theory, points out that the inequality of nations at different stages affects development and enforces the dominance of nations with greater resources and capabilities.[32] He separated nations into three major categories: (1) the core – regions that benefit most from the capitalist world economy, (2) the semi-periphery – regions between the two extremes that are either in decline or attempting to improve their relative positions, and (3) the periphery – at the other extreme, areas lacking a strong central government or controlled by other States, which provide labor or other resources to the core States.[33] The presentation of comparative theories and criticisms of Wallerstein are beyond the scope of this argument. However, the major point here is that Wallerstein points out that a division of labor exists among nations. This social reality suggests that various forms of inequality exist among nations, and two of the key measures are economic developmental status and social organisation. Moreover, those States that find themselves in the semi-periphery or the periphery lack the political clout to demand their participation in markets and policy negotiations in any area of global governance, whether it be related to making widgets for automobiles or spacecraft. In addition, of course, astronauts from nations without a

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[31] Max Weber, *The Theory of Social and Economic Organization*, Translated by Talcott Parsons, (New York: Free Press, 1997).

[32] See Immanuel Wallerstein, *The Modern World System: Capitalist Agriculture and the Origins of the European World Economy in the Sixteenth Century* (New York: Academic Press, 1974).

[33] Paul Halsall, "Modern History Sourcebook: Summary of Wallerstein on World System Theory", online: Fordham University <http://www.fordham.edu/HALSAll/MOD/Wallerstein.asp>.

spaceflight capability are entirely dependent on those that are capable to obtain a ride into space.

Astrosocial phenomena have unique effects on different nations and thus each nation cannot take advantage of space opportunities at the same level. The problem before us is how our species can govern on a global basis while access to space and thus space assets vary tremendously. One of these dimensions of inequality focuses on the ability or lack of ability to transport equipment and/or individuals into at least low Earth orbit. Concentrating on the space agency level, one may identify three levels of advancement as described below:

1. *Pre-space-capable societies* lack the spaceflight ability on their own, and must therefore depend on other nations to provide this capability.

2. *Space-capable societies* possess spaceflight capabilities without assistance from other nations.

3. *Spacefaring societies* reflect a theoretical level of integration between space and social institutions, groups, culture, and individuals prior to the possibility of spacefaring regions and a single spacefaring civilisation, the latter of which may result is a single global governing body.[34]

Historically, unequal capabilities and resources within the international community place certain nations at a disadvantage that only time alone (internal advancement) and/or assistance from space-capable nations can change. The rate and characteristics associated with the advancement of human civilization as a whole vis-à-vis the specific area of space exploration depends much on the intermingled, ever-changing relationships among nations. If space-capable societies assisted pre-space-capable societies, we could measure advancement of humankind's overall ability to grow and govern space activities. This raises an important question, however. How willing are space-capable nations to assist less well-developed pre-space-capable nations?

B. THE REALITY OF DIVERGENT INTERESTS

While there are many other examples of divergent interests that could affect the ability of social groups to achieve global space governance, for the sake of brevity we address those divergent interests most common to space issues. First, inequalities of various types exist among nations, including among space-capable nations. However, the pre-space nations possess the least say in their participatory level in making space policy on a global level. Yet space-capable nations can choose how they respond by either providing pre-space-capable nations with greater input into space affairs or maintaining and even increase the level of inequality. The status quo is not fully conducive to maximising the potential of space exploration and settlement. Space-capable developed

[34] Jim Pass, "An Astrosociological Perspective on Space-Capable vs. Spacefaring Societies." 20 (2011) 20 Physics Procedia 369.

nations largely carry out how space governance functions due to differences in power relationships that stem from the knowledge and resources needed to pursue space exploration and exploitation even though global space governance remains largely the realm of the elites and often downplays or even ignores the concerns and potentially beneficial input of those States less powerful.

Second, even where technological resources and capabilities create barriers of entry to space activities, cultural factors also play a role in seeding divergent interests. How nations view their reputational standing relative to other nations varies and can lead to a willingness to avoid cooperative endeavours or a failure to seek resolutions to international governance problems that may or may not affect the internal ordering of a nation. For example, since the creation of the United Nations in 1945, the antagonistic relationships between some members of the United Nations Security Council have led to a variety of governance failures (i.e., failure to maintain international peace and security).[35] Examples include issues of regional import on the Korean peninsula, the Crimea, the Balkans, and Central Africa. In addition, historical factors may also limit the ability for a nation or a social group to seek participation in solving problems that arise from an inability to communicate or trust. For example, the inability for the United States and Iran to hold diplomatic relations from 1979 to 2015 limited the ability of each State to engage each other bilaterally.[36] While both are examples of failure to cooperate toward the resolution of a governance problem, international fora have proliferated since the end of World War II and provide a means of communication and coordination that constrains the level and number of issues nations can discuss. Thus, international fora provide an important means by which nations engage each other in dialogue to some practical extent. While some international fora function to provide leadership or consensus on governance of international problems, their main ability is to bring together nations with divergent interests to engage in dialogue. Such a congress provides a necessary social ordering mechanism that enables nations the ability to work towards cooperation through dialogue. By no means do we imply this is determinative, but the reality is without a means by which to order nations together into a venue of dialogue we cannot expect cooperation and coordination to occur to solve global space issues or create governance structures to protect persons and property. In the end, resolution of international space problems and the governance of space activities are what States make of it. The question is how do States find ways to look past divergent interests and find common interests?

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[35] See Michael W Doyle & Nicholas Sambanis, *Making War & Building Peace: United Nations Peace Operations* (Princeton, NJ: Princeton University Press, 2006).

[36] Christian Emery, *Policy and the Iranian Revolution: The Cold War Dynamics of Engagement and Strategic Alliance* (New York: Palgrave Macmillan, 2013).

Lastly, divergent interests also arise from the fact that many States view space as the high grounds for military operations. The militaries of developed nations conduct and have conducted secretive and not so secretive operations in Earth orbit. This raises the issue of trust and communication related to space activities, as national security tends to limit discussions of global space governance to civil and commercial activities. Even where social groups seek to find common interests on issues of national security,[37] the dual use nature of many space technologies creates additional complexities. Often these complexities, and the need to maintain operational and technological flexibility, can prevent any discussions on the governance of space weapons.[38]

C. EXAMPLES OF PARTICIPATORY CHARACTERISTICS AMONG DEVELOPING NATIONS

Due to their lack of scientific and technological development, and perhaps based most strongly on their economic status among nations, developing nations must rely to a significant extent on the assistance and purposeful inclusion of space-capable nations in managing space issues. Developing nations' space activities differ from the historical patterns set by their more technologically developed peers both in practice and in philosophy. The American drive to space was fueled primarily by its Cold War rivalry with the Soviet Union. The race to the Moon – by the only two nations capable at that point of playing the game – precluded any hope of early collaboration. In contrast, Bolivia and Venezuela's satellites were launched with help from China; Chile appealed to the United Kingdom and Russia; the United Arab Emirates (UAE) contracted with South Korea to design and build their Dubai-Sat 1 and 2; and Argentina's SAC-D satellite launched with logistical and launch support from NASA.[39] Often lacking homegrown launch facilities and the necessary scientific expertise and experience, collaboration is a reality embraced by most developing nations as a necessary stepping-stone to what the Center for Strategic and International Studies (CSIS) has termed "space independency".[40] Of note is that the collaboration is as likely to be with a private corporation as with a sanctioned government agency. Thus, Chile's FASAT-Charlie satellite was built with the UK's Surrey Satellite Technology, Ltd. and the United Arab Emirates inked a US$ 280 billion deal with Virgin Galactic to build a

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[37] Examples include the Secure World Foundation, Stimson Center, Marshall Institute, and others on issues ranging from GPS use to nonproliferation.

[38] The current international climate in which nations seek to both: (1) protect their security interests through the militarisation of space and (2) pursue space exploration and space research complicates cooperative ventures due to a palpable level of mistrust. Space governance may be easier to accomplish when focusing on the latter types of issues while the former tend to remain more secretive and outside the bounds of shared control, especially when military hardware is first constructed and made operational.

[39] See Charlie Hamilton, "UAE Leads the Middle East's Race into Space" *The National* (30 July 2009), online: The National <http://www.thenational.ae/news/uae-news/uae-leads-the-middle-easts-race-into-space#page2#ixzz2zeUkGVTu>;
W Alex Sanchez, "Latin America's Space Programs in 2012" *The Space Review* (27 August 2012), online: The Space Review <http://www.thespacereview.com/article/2143/1>.

[40] Sanchez, *supra* note 39.

spaceport in Abu Dhabi.[41]

Similarly, the sprouting of increasingly large and sophisticated ground based optical and radio telescopes, sponsored and financed by space institutes in developed countries, but often physically located in developing nations – notably Chile and sub-Sahara Africa – is a second prime area of collaboration. The combination of high elevations, low humidity climates, clear line of sight, and reduced local radio interference make these locations ideal.[42] Some of the largest of these, the radio Square Kilometre Array (SKA) will be built in South Africa with local data receiving stations scattered among nations such as Kenya, Ghana, and Zambia. South Africa is already home to the optical South African Large Telescope (SALT) and the upcoming radio telescope, MeerKAT.[43] The optical European Extremely Large telescope (E-ELT), planned for the Chilean mountains, will allow astronomers to directly view extra-solar planets for the first time.

Philosophically, the reasons that developing nations commit their own sparse national resources to space activities—primarily satellite launchings—also show that they are not merely retracing the footsteps of the 1960s. Satellite technology and the data that it generates are seen as a practical way to jumpstart economies with foreign partnerships, maximise agricultural output by mapping drought and flood prone zones, optimize mobile telecommunications; anticipate and mitigate natural disasters, monitor deforestation caused by over harvesting or heightened carbon dioxide levels, and even track population density for voting purposes.[44] These tangible benefits of space-related technology create footprints on Earth that are far more economically, politically, and socially valuable to developing countries than are, for example, Chinese aspirations at one day stepping into Americans' footprints on the Moon. Likewise, NASA's focus on astrobiology and asteroids along with private corporations' initiatives in space tourism, elevators, and Martian settlements, are not high priorities for developing nations, which are just beginning to reap the barest of spinoff benefits from their nascent space activities.

This is not to say that the national pride such as that which fueled Yuri Gagarin's historic 1961 spaceflight or Apollo 11's 1969 lunar landing no longer matter. Latin American pride swelled when Peruvian scientist

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[41] Hamilton, *supra* note 39; Sanchez, *supra* note 39.

[42] Curt Hopkins, "African Space Programs Aren't Science Fiction", *OkayAfrica* (20 May 2013), online: OkayAfrica <http://www.okayafrica.com/2013/05/20/african-space-programs-arent-science-fiction/>.

[43] *Ibid.*

[44] See Connor Adams Sheets, "Nigeria's Space Program: A Rare Glimpse Inside The West African Nation's Satellite Operation" *International Business Times* (27 September 2013), online: International Business Times <http://www.ibtimes.com/nigerias-space-program-rare-glimpse-inside-west-african-nations-satellite-operation-1411236>; Johanna Mendelson Forman, et al, *Toward the Heavens: Latin America's Emerging Space Programs*, Center for Strategic and International Studies, online: CSIS <http://csis.org/files/publication/090730_Mendelson_TowardHeavens_Web.pdf>; and Hamilton, *supra* note 39.

Melissa Soriano worked on the NASA/JPL team that put the Curiosity rover on Mars and Nigeria proudly created its own launching platform and hopes to have their first astronaut in space by 2015.[45] However, overall, their national pride in space exploration derives more from the ability of the resulting investment, satellite data, and learned technology to have a direct and positive impact on job creation, education, and on creating a base of scientific knowledge. Crossing new frontiers in deep space exploration is neither the goal nor the rhetoric for most developing countries right now. Citing the African focus on astronomy over manned exploration, one South African scientist explained, "Telescopes-on-the ground is very achievable and we can produce world class science from them. In terms of development, astronomy catches the imagination of everyone, children to old folks; it brings cultures together".[46]

This pattern of collaboration with developed countries, however, is not without controversy. While it provides much-needed nuts-and-bolts support, Western investment and collaboration, especially, open up the process to renewed accusations of colonialism and paternalism. In Africa, those who are older still remember Western exploitation and advocate treading cautiously. Younger citizens are more proactive and vocal in their support for international partnerships and the jobs it can create.[47] The risks are clearly balanced in favor of the developed nations, which have little real competition from the fledgling satellite launches and technology education programs that are the developing countries' major areas of focus. Brazil may eventually prove to be an exception here. It is attempting to reduce its dependency on its Chinese partner with the construction of its own launch facilities and is staking out a regional leadership role through the creation of a pan-Latin American Alliance of Space Agencies, similar to the European Space Agency.[48] Indeed, future collaboration may take on a more regional form—with developing countries' increasing both their collective influence and the sophistication of their initiatives—as efforts to create both formal pan-Arab and pan-African space alliances are also underway.[49] Pan-Asian cooperation has been ongoing since 1993 through the Asia-Pacific Regional Space Agency Forum (APRSAF), with a focus on the environmental and disaster-related benefits of space technology, and mentioning the Asia-Pacific Space Cooperation Organization (APSCO), spearheaded by China and established in 2005 and modelled after ESA.

The realities of both geopolitics and ongoing concerns about the military or political use of satellite data may undermine developing countries' efforts at building either homegrown or collaborative space programs. It is understood that there are legitimate national defense uses

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[45] Sanchez, *supra* note 39; Hopkins, *supra* note 42.

[46] Hopkins, *supra* note 42.

[47] *Ibid*; and Sheets, *supra* note 44.

[48] Mendelson Forman, et al, *supra* note 44; Doug Messier, "Brazil Proposes Latin American Space Alliance" *Parabolic Arc*, (17 November 2013), online: Parabolic Arc <http://www.parabolicarc.com/2013/11/17/brazil-proposes-latin-american-space-alliance/>.

[49] Hamilton, *supra* note 39; Hopkins, *supra* note 42.

for satellite data—one of the reasons to create regional space alliances is to better pool and utilize defense-relevant data.[50] Pan-alliances may even embolden nations to seek common ground on their technological futures despite lingering political, ethnic or religious differences. But while many developing nations have firmly placed their space programs under civilian—rather than military—control; will there be a temptation to this time follow in the West's historical footprints and "look to space as a new frontier for weapons"?[51] This is an on-going issue important to future global space governance and doubtless, if ever, will this issue fade away in time.

D. AN EXAMPLE OF CULTURAL (MIS-)UNDERSTANDING: JAPAN CULTURE AND ITS VIEW OF SPACE ACTIVITIES

By way of example, the relationship between the United States (US) and Japan in the field of space development is very close and crucially so, due to Japan being one of, if not, the closest ally for the US in the Asian subcontinent. This is especially important to consider when we look at the rapid rise of China and India in the field. Thus, Japan will most likely be evermore involved in future endeavours of the US and European space programs. However, there are several cultural differences, which may throw a spanner in the works regarding such collaborations.

The Japanese public's attitude to space exploration is naturally different to the US approach for many reasons, not least of which being historical factors. The post-WWII reconstruction era forced Japan to adopt (and adapt) a multitude of foreign technology (including the now-contested nuclear power) and techniques, and as a result, by the 1970s, had a booming economy based on exports of technological consumer goods – the Japanese space industry came about as a side project of this. The peace-oriented constitution of 1947 prohibited any and all activities of warfare. Thus Japan's space programme, though modelled on NASA's example in many ways, was unique in the sense that it was not touted as a project for the purposes of supremacy during the Cold War, which it could have served as a catalyst for a heightened sense of patriotism, one of the defining characteristics of the US' space programme. Instead, the Japanese programme lacks this patriotism, and therefore Japanese society is not conditioned to think of outer space as anything particularly relevant to Japanese everyday life. What we see instead within the general public is an attitude of romanticism towards the stars, with creative works by photographers, artists, musicians and the like taking inspiration from space and a generations-long tradition of highly-developed science-fiction and fantasy subculture groups. The rest of mainstream society then sees these groups as outsiders, resulting in social gaps, where the general understanding concerning issues related to space can vary from having little to no knowledge, to being well versed in Heinlein, Clarke, and NASA history. As a result, the mainstream is heavily compartmentalised, and the

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[50] Sanchez, *supra* note 39.

[51] Mendelson Forman, et al, *supra* note 44.

mass media struggles to find common ground to cater to when dealing with technological and scientific news and features. It can be argued that there is no homegrown mainstream science fiction on television, for example – this is a marked difference to the ubiquitous presence of Star Wars and Star Trek in the West, which played a role in creating a society conducive to space development.

Signs are pointing to these trends beginning to change, however – the year 2014 alone will see the release of the latest Space Brothers movie, which is a popular media property, based on a comic book series about two brothers who become astronauts. The tone of the series is very down-to-Earth and relatable on a humanistic level, thus providing an ideal "in" to the topic of outer space, to which there would normally be resistance from the mainstream. Perhaps more importantly, at least in Tokyo, is the opening of TenQ, which is a new space museum featuring a giant screen designed to invoke the feeling of travelling over the Earth from orbit. Additionally, a Space Expo was announced for late in 2014. Both represent projects that promise further mainstream interest and may perhaps fuel an appetite for a stronger popular science presence in society.

However, as the current situation stands, although on the academic and technical level the rapport is a healthy one, the collaboration between the US and Japan appears fragmented in terms of cultural exchange. Communication is not always available to settle differences. Even worse, cultural misunderstandings can result in mistrust and even various forms of conflict that place limitations on cooperative efforts and thus the potential effectiveness of global space governance. One exception to this may be the case of Japan, which remains dedicated to the peaceful use of space for all humankind, rather than national interests, with research projects such as the Greenhouse Gases Observing Satellite (GOSAT) "Ibuki," which measures CO_2 and other greenhouse gas volume by global region.[52] However, the aforementioned looming Indian and Chinese influence in aerospace and its diffusion in the Asian media may begin to put Japan in an uncomfortable position in terms of its already-shaky political relationship with its surrounding countries, not least because of heavily publicised territorial disputes. The US remains Japan's strongest and closest ally, and the settling of talks concerning the Trans-Pacific Partnership (TPP), with the changes in regulations it implies, as well as the proposed amendments in Japan's constitution to extend the conditions and situations for deployment of its Self-Defense Force will no doubt affect its attitude towards the space programme. Public fears regarding these changes have resulted in protests, and the possibility of a resurgence of nationalistic spirit is not out of the question, rather, it is a major source of anxiety within Japanese society today. It may be that closer ties with the US will put Japan in a tougher position even than now, in terms of its relationship with the rest of Asia. Therefore, it is imperative to consider social and cultural differences and regional contexts to ensure mutual benefits and limit the risk factors in international cooperation.

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[52] Nies Gosat Project Newsletter, Issue 30 (March 2014), online: GOSAT <http://www.gosat.nies.go.jp/eng/newsletter/newsletter30e.pdf>.

E. SOME OBSERVATIONS

The above analysis represents the minimal number of issues and variables that are required to study global space governance. The basic analytical framework provided above represents how astrosociologists can attempt to dissect the problem of global space governance. The complex social orderings that arise from space activities generate additional variables of study and provide a framework for investigation. The challenge is to operationalise the high-level concepts discussed in order to conduct a proper analysis of the precisely defined variables. From an astrosociological perspective, the astrosocial phenomena involved are understood best through interdisciplinary investigation practices.[53]

IV. SPACE GLOBAL GOVERNANCE THROUGH THE LENS OF ASTROSOCIOLOGY

Despite existing and potential international governance problems among nations, the attempt to build and maintain a system of global space governance remains an important goal. This section focuses on both positive and negative social and cultural forces that affect the governance of space issues on a global scale. The dynamics involved make this area of research complicated, but also fascinating. The lens of astrosociology provides a multidisciplinary social-scientific methodology that utilises the greatest strengths of the social and behavioral sciences, and the humanities, in combined approaches that are still being discovered as astrosociologists pursue the study of various space-related astrosocial phenomena.

Cooperative efforts can push along growth in humankind's overall level of progress toward advancing space exploration and migration. It seems obvious that progress for *all* humankind increases with the level of cooperative efforts – along with the minimisation of conflict – although the details of how this may occur can be quite complex. Social and cultural forces that favor conflict in various areas of relations among nations can impact efforts to forge cooperative initiatives. However, efforts continue to promote positive relations generally as well as cooperation in space policy and actions.

One example, in which cooperation is vital, in terms of both limiting governance problems and ameliorating it, is that of space debris in low Earth orbit. There are approximately 22,000 trackable pieces of debris ten centimeters or larger, and thus no one government can solve or even greatly mitigate the problem alone.[54] Unless one nation or non-governmental organisation can come up with a rather unlikely single

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[53] See, for example, Ulrike Landfester, et al, eds, *Humans in Outer Space: Interdisciplinary Perspectives* (New York: Springer-Verlag/Wein, 2011); and Albert A Harrison, *Spacefaring: The Human Dimension* (Berkeley: University of California Press, 2001).

[54] Gopalaswamy, Bharath. "Space Governance: A Modest but Important Start" (Opinion). *Space News*, November 4, 2013. (Accessed 04/11/14). URL: http://www.spacenews.com/article/ opinion/37989space-governance-a-modest-but-important-start.

affordable solution, cooperative efforts – and probably complicated ones at that – seem the likely option. The question is this: how much worse will the problem become before greater governmental and non-governmental entities become serious in cooperating to find an answer rather than following their own interests, many of which exacerbate the problem as witnessed by China's anti-satellite weapon test in 2007? Without some semblance of a cooperative environment, global space governance becomes more difficult to exercise. If not taken seriously, especially among the most influential players, cooperation becomes limited to a smaller group of nations.

One of the major forces that attempt to build a cooperative future for global space governance is the United Nations and its department called the United Nations Office for Outer Space Affairs (UNOOSA). The UNCOPUOS seeks to promote cooperative relationships among governmental and non-governmental organisations concerned with outer space. The Committee works with these organisations to promote the non-military use of outer space. It is somewhat effective due to the fact that it is one of the larger committees within the United Nations structure, consisting of 76 members that produced five treaties, dozens of non-binding rules and resolutions, and hundreds of working group reports addressing problems of space activities.

Not all analysts have concluded that the United Nations' efforts are helpful or have a good chance to succeed.

> For this reason, we must all work together and take action now to establish measures that will strengthen transparency and stability in outer space. This work toward transparency and confidence-building measures will enhance the long-term sustainability, stability, safety and security of the space environment. It is in the vital interests of the entire global community to protect the space environment for future generations.[55]

Transparency requires trust, which is not always easily granted among developed nations or between developed and developing nations.

The fact that nations exist implies that each has its own culture, set of subcultures, social structures, and history makes obvious the concluding fact that each has its own unique justifications for joining the space exploration fraternity. While negotiations can bring about new levels of cooperation, they can also point out differences between cultural values that make competition and conflict more likely. National pride and national security can intertwine to increase suspicions and increase the likelihood of mistrust.

Sometimes the pursuit of space exploration begins partly as political positioning between nations while such space activities may not be in the best interest of the average citizen. The space race between Pakistan and India, for example, pours an ordinate amount of resources into scientific research and technological development while considerable numbers

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[55] Eberhardt, *supra* note 30.

within their populations live in poverty. Such circumstances demonstrate the importance of space in the international community, which is associated with the fear held by the leadership of many developing nations regarding their weak standing in this area and their resulting vulnerability in relation to other nations. National security issues are therefore intertwined with the prestige of their space capabilities, which places at least some limitations or difficulties on cooperative efforts.

For example, Pakistan, being suspicious of India's motives for pursuing space exploration, is attempting to catch up with their own space programme called SPARCO.[56] China and North Korea assist Pakistan to develop its space program, which may transition into a military race if present trends continue.[57] These types of circumstances are not conducive to building the type of trust between nations that is necessary to participate in joint projects and programmes. Moreover, such an eventuality can threaten existing agreements or cause modifications that account for these types of negative developments.

On the larger stage, a case exists for a new space race between the United States and China.[58] If the dynamics become anything like the Cold War politics and military tensions between the United States and the Soviet Union from 1945 to 1991, space-related agreements and treaties will become much more difficult to negotiate. Other societal institutions, such as politics and the military services, will impinge upon purely space-related considerations. The peaceful uses of outer space will potentially become impossible to take seriously if the influence of the United Nations and existing agreements are ignored and violated in the pursuit of what nation's involved deem as more pressing matters. National security will most likely trump global space governance interests if a new Cold War breaks out as the old battle between capitalism and communism begins anew.

Of course, such extreme levels of conflict and competition do not present the world with an inevitable scenario. Developed nations can assist developing nations to approach space exploration and the resulting technological development in ways that are more positive. One of the tenets of global space governance is to garner cooperation and peaceful uses of outer space. Otherwise, any thought about an international cooperative apparatus is just a pipe dream. Thus, astrosociologists are interested in studying the social and cultural forces that exacerbate both cooperation and conflict, and how their interactions move the characteristics of global space governance forward into the future.

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[56] Arif Ansar, "Indian Threat Moves to Space." *Pakistan Today* (28 April 2012), online: Pakistan Today <http://www.pakistantoday.com.pk/2012/04/28/comment/columns/indian-threat-moves-to-space/>.

[57] James C Moltz, *Asia's Space Race: National Motivations, Regional Rivalries, and International Risks* (New York: Columbia University Press, 2012).

[58] Erik Seedhouse, *Space Race: China vs. the United States* (Chichester: Praxis Publishing, Ltd., 2010).

The appearance of private companies on the space exploration scene complicates the ability of States to control their governance over all space affairs. For example, NASA's delegation of crew and cargo transportation capabilities to support a Commercial Crew Program (CCP) and commercial cargo companies—such as Space X, Boeing, Orbital-ATK, Sierra Nevada, and others—creates an innovative, but challenging template for future space governance. These, and other private spaceflight companies that focus on space tourism (Virgin Galactic, Bigelow Aerospace, XCOR), space mining (Planetary Resources), or space colonisation (Mars One), are engaged in a new, profit-driven twenty-first-century space race that is inherently "wild . . . commercial, bootstrapping [and] imaginative".[59]

Benefitting from decades of NASA technology and experience, and often relying upon both present and promised future NASA contracts for their lifeblood, these companies exist largely outside the space agency's notorious bureaucratic, funding, and governance bottlenecks. However, they may also lie outside NASA's longstanding vision – going back to its original creation in 1958 – of benefitting all of humanity through nationalistic means.[60] The hefty US$ 250,000 ticket price for a two-hour tourist flight to suborbital space on Virgin Galactic's SpaceShipTwo will be out of the reach of the vast majority of Earth's people – in both developed and developing nations. While expiration of patents and economies of scale may eventually bring prices down to several tens of thousands per jaunt, space tourism – apart from the isolated windfalls of hosting a space debarkation port – is likely to neither reach nor benefit economically distressed populations. There is also the question of whether private space corporations will follow NASA's example and release proprietary technology research that would likely catalyse their own competition in the space marketplace. NASA's April 2014 release of open source coding for more than 1,000 different projects, combined with nearly five decades of public-private technological cooperation sets a high bar for future collaboration that may be difficult, if not unrealistic, for private corporations to emulate.[61]

More challenging still is the question of reining in this diverse field of space entrepreneurs in any hopes of creating a larger legal framework for regulation of space activities. Questions over ownership of celestial bodies, for example, were presented in the Outer Space Treaty of 1967, and may resurface with the rise of corporate, rather than national, development of space geography and assets.[62] Should rights of ownership

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[59] Joel Achenbach, "Which Way to Space? Flights of Fancy May Launch the Industry's Future", *The Washington Post* (23 November 2013), online: Washington Post <http://www.washingtonpost.com/sf/national/ 2013/11/23/which-way-to-space/>.

[60] *National Aeronautics and Space Act* of 1958, Public Law 85-568, 72 Stat 426.

[61] Robert McMillan, "Wanna Build a Rocket? NASA's About to Give Away a Mountain of Its Code" *WIRED* (3 April 2014), online: Wired <http://www.wired.com/2014/04/nasa-guidebook/>.

[62] Property ownership by private citizens and companies, such as the sale of parcels of land

follow from the sizable private investment required for development? Will it precede it? Will it remain divorced from it? If the concept of ownership cannot apply, will these private corporations instead seek stewardship of the geography and assets they are spending millions to explore and develop? And if many of the private space companies are themselves bolstered by the continued contract and research support of government and quasi-government entities such as NASA, Roscosmos or ESA, at what point does private ownership of space become a thinly-veiled proxy for the very national ownership that the Outer Space Treaty idealistically sought to avoid?

The 1950s and 1960s witnessed the competition of two superpowers vying for hegemony in the newest frontier of the Cold War, outer space. The initial military and nationalist objectives of space exploration, combined with the sophisticated technological knowledge and financial investment required to engage in space activities, quickly created an uneven balance of space access and utilisation between the few developed nations that could engage in and benefit from space technologies and the majority of the nations on Earth that could not. The United Nations has addressed this wide inequality among developed and developing nations in space research, exploration, and the application of space technologies through a series of international conferences and resolutions seeking to extend the benefits of space to all nations.

In 1968, the United Nations convened the First United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE). This conference firmly reaffirmed the provisions of Article 1 of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. It states that:

> the exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.[63]

The intent of this initial conference was to highlight the disparity between developed and developing countries in their space ambitions and activities, and to suggest a plan forward for ameliorating that disparity through awareness, education, and laying the groundwork for future collaboration. A major outcome of this inaugural conference was the creation of the United Nations Programme on Space Applications, which would spearhead the implementation of the UNISPACE conferences'

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on the Moon, challenge current space law tenets that prohibit such activities. One can easily dismiss such activities, and they do not require the expenditure of the time, resources, and effort needed to govern them. Corporations do potentially present regulators with more serious challenges as they may well violate existing space law in their pursuit of profits. One important question is this: what is the tipping point that will encourage them to move forward in developing property beyond the bounds of Earth?

[63] *Outer Space Treaty*, *supra* note 1, art 1.

recommendations.[64]

The second UNISPACE conference in 1982 built upon this foundation and launched a long-term initiative to cultivate and facilitate opportunities for developing countries to train researchers and engineers in the space sciences. To date, this initiative has culminated with the development of five Regional Centres for Space Science and Technology Education, located in India, Morocco, Nigeria, Mexico/Brazil, and Jordan.[65] These centres focus on the tangible application of Earth observational space technologies in weather forecasting, disaster mitigation, telecommunications, and agricultural planning.[66]

UNISPACE III, convened in 1999, and continued these educational initiatives amid a changing geopolitical scene that had seen the end of the Cold War, which had – for better or worse –defined the early parameters of the space race. The earlier 1996 "Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States Taking into Particular Account the Needs of Developing Countries" had clearly reaffirmed the United Nations' position from nearly thirty years earlier, stressing that space activities "shall be carried out for the benefit and in the interest of all States, irrespective of their degree of economic, social or scientific and technological development".[67] It further cautioned, "Contractual terms in such cooperative ventures should be fair and reasonable,"[68] in effect acknowledging the unequal balance of negotiating power between the respective parties and perhaps anticipating the emergence of private corporate players in the coming millennium. Overall, both the 1996 Declaration and the 1999 UNISPACE III conference recast the collaboration between developed and developing countries as ideally a mentoring relationship focused on:

> (a) Promoting the development of space science and technology and of its applications;
>
> (b) Fostering the development of relevant and appropriate space capabilities in interested States;
>
> (c) Facilitating the exchange of expertise and technology among States on a mutually acceptable basis.[69]

UNISPACE III initiatives included extending benefits of space technology to developing countries through tracking of space debris,

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[64] See United Nations Office for Outer Space Affairs, "History of the United Nations Programme on Space Applications", online: UNOOSA <http://www.oosa.unvienna.org/oosa/SAP/history.html>.

[65] Mexico and Brazil are considered dual campuses of the same Regional Centre.

[66] *History of the United Nations Programme on Space Applications*, *supra* note 64.

[67] *Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries*, UNGA Res 51/122, UN Doc A/RES/51/122 (1996) [*Space Benefits Declaration*], para 1.

[68] *Ibid,* para 2.

[69] *Ibid,* para 5.

telemedicine and education, enhanced satellite-based communications systems, mitigation of climate change and relief in both natural and human-made disasters.[70] While UNISPACE III acknowledged, "that humans have always gazed at the sky with wonder," their recommendations remained decidedly Earth-bound and pragmatic, stressing the tangible benefits of space technology over the more esoteric satisfactions of discovery.[71]

In 2001, General Assembly Resolution 55/122 explicitly issued an invitation for all parties "to expand the scope of international cooperation relating to the social, economic, ethical and human dimension in space science and technology applications".[72] This vision of collaboration further deepens the bond between developed and developing countries, and embraces the dynamic social constructs of race, class, gender, ethnicity, and so on. While it advocates for a more holistic and interdependent collaboration, the UN has few tools at its disposal to enforce compliance, especially from commercial space companies that represent latecomers to relationships that the UN has been trying to cultivate for more than forty years.

In an admirable, albeit somewhat idealistic vision, that the current path of the UN is to utilise the application of space assets, research, and technology to benefit and expedite the UN's overall global objectives of "economic stability, sustained economic growth, the promotion of social equity and the protection of the environment, while enhancing gender equality, women's empowerment and equal opportunities for all, and the protection, survival and development of children to their full potential, including through education".[73] As basic sustainability and educational competency levels are met – even exceeded – and developing countries seek a more assertive and independent role in satellite or manned launches, future tensions may arise over common access to celestial bodies, a share of mined asteroid or lunar resources, and more than token representation on human spaceflight missions, to name just a few of the potential areas of conflict. Further, the vision will likely need reappraisal again to more fully account for the leadership of commercial space companies, whose geopolitical priorities in the developing countries they invest in may run counter to a mentoring or collaborative model. For example, how will the United Nations mediate possible corporate demands for ownership of common space assets in exchange for boosted investment in developing countries' social and scientific infrastructures? Finally, as expectations and demands that space research and exploration yield both increased social equality and social equity, so too will the need

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[70] Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, *The Space Millennium: Vienna Declaration on Space and Human Development*, Vienna (19-30 July 1999), online: UNOOSA <http://www.oosa.unvienna.org/pdf/reports/unispace/ACONF184_6E.pdf>, para 1.

[71] *Ibid.*

[72] *International Cooperation in the Peaceful Uses of Outer Space*, UNGA Res 55/122, UN Doc A/RES/55/122 (2001), para 44.

[73] *The future we want*, UNGA Res 66/288, UN Doc A/RES/66/288 (2012), Annex, para 11.

increase to further investigate and interpret these emerging dynamics from an astrosocial perspective.

Governance in the international community is no longer confined to government institutions, as new actors have been granted a form of legitimate authority that is not State-based and therefore at least somewhat independent of space agencies.[74] Non-governmental organisations can acquire power in the international community through their practices and contributions to the space community. Space is no longer the sole domain of government institutions. The appearance of private companies on the space exploration scene, such as SpaceX and Bigelow Aerospace, complicates the ability of States to control their governance over all space affairs provides deeper investment in governance over space activities.

The fact that private companies have entered the fray by achieving spaceflight one can assume – at least thus far – that private companies have achieved the ability to ferry humans and equipment into space operate in some capacity within space-capable societies. The government or public sector develops spaceflight capability before the public sector becomes involved. Nevertheless, this implies that relations among space-capable entities, whether public or private, will become increasingly complicated and potentially more conflict oriented. It is unclear what path may be followed due to the complexities that arise from government and private spaceflight coexisting. Will divergent interests stifle common interests leading to governance failure over space activities? Conversely, is there a better way forward? We certainly believe more study is needed.

V. CONCLUSIONS AND OBSERVATIONS

Astrosociology can aid in the study and thus understanding of how astrosocial phenomena may, and do, manifest in the area of global space governance. These phenomena can support and undermine treaties and regimes in place, affect those in the negotiation stages, and those that may not even reach the negotiation stage. Global space governance is not easy. It is fraught with conflict and competition, which threatens to move squabbles between nations to Earth orbit. Ground based systems also exist that have military applications. Anti-satellite weapon tests have already resulted in successful "kills." While the United Nations attempts to promote the peaceful use of outer space, it remains unclear how far the militarization of space will develop alongside peaceful cooperative efforts. This is one of the most serious challenges of global space governance, as military operations and testing of hardware have already occurred.

Space governance taking place on a global scale proceeds in ways that result in races to be the first to accomplish something or a devotion to reproduce accomplishments of the past, the latter of which China and India provide good examples. Consistent interests can build upon past successes while divergent interests can slow development toward new

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[74] Rodney B Hall & Thomas Biersteker, "The Emergence of Private Authority in the International System" in Rodney B Hall & Thomas Biersteker, eds, *The Emergence of Private Authority in Global Governance* (Cambridge, England: Cambridge University Press, 2002).

achievements. However, at times, allowing and especially assisting developing nations to duplicate past achievements brings developing nations closer to the level of advancement of developed nations and thus makes the former better partners for future progress in space. On the other hand, allowing developing nations to approach the level of advancement of developed nations could theoretically make them stronger adversaries should political and/or economic interests diverge to the point that space becomes an extension for the terrestrial battlefield.

The goal of global space governance is the creation of an international climate in which all States benefit from space technological and scientific knowledge, their practical beneficial outcomes – which include economic and political wellbeing – and other advancements in the improvement of the social lives of all citizens of the world. Developing nations may come to view space as a means to develop their economic status. Participation in the space and aerospace markets can yield both respect and economic growth. For this to become a reality, the inequality that exists today requires mitigation and a new level of cooperation among States at all status levels. Is international cooperation feasible when internal security interests within States hold such a strong influence? It would take a very strong commitment among the developed nations, as they would need to relinquish their standings in the international community to some extent and allocate resources to assist their development and participation in space affairs.

With the number of space-capable nations growing, and the existing ones becoming more sophisticated as time passes, global space governance is sure to become more challenging due to the potential for greater conflict. Even indifference regarding space governance affairs can result in less than optimal policymaking on the global stage. Global space governance is fraught with competing interests and conflict. Social inequality among nations makes cooperative efforts more difficult, yet cooperation does occur in spite of conditions that seem unfavorable.

The commercialisation of space raises important questions. How does the relatively new commercialisation of space exploration and potential settlement affect inequality among nations? Will a Wallersteinian system replicate itself on the Moon, Mars, and elsewhere beyond Earth? What preparations at the international level can mitigate social inequality? Developing nations that dedicate themselves to progress in the space and aerospace markets can provide more developed nations with incentives to assist and work with them for the benefit of each and overall production.

Humankind has not yet migrated into the outreaches of outer space beyond the International Space Station (ISS). Lessons learned aboard the ISS in terms of global governance on a small scale can provide insights into future realities in space. However, governing isolated communities and later societies that establish themselves in extraterrestrial environments in the future will pose greater challenges. Will a new form of imperialism establish itself in space in which less powerful nations, groups, or social categories become subjugated to the more powerful

ones? One may argue that an important part of global space governance is not limited to terrestrial locations and concerns, but to extraterrestrial ones as well. If so, this means that humanity must work harder to secure the future it wants, including the level of inequality that is tolerable.

An important lesson to keep in mind from the foregoing discussion is that global space governance consists of a myriad of both cooperative and competing issues, values, norms, interests, and hidden agendas, all of which make space governance of a global scale difficult to implement and coordinate on a sustained basis. Additionally, social and cultural change within participating societies results in ongoing possibilities of conflict and reduced levels of cooperation in various areas. Global space governance is difficult, but it is certainly not impossible by any means.

If global governance of space affairs is to succeed at an organised and inclusive level, the inequality among nations must become a greater focus for policymakers, political officials, and others. Astrosociologists and others need to flush out more issues and pursue research focused on how the inequality among nations affects global space governance. It represents a significant under-investigated area that requires immediate attention. We hope that this exercise spurs additional attention and further research into the astrosociological implications of global space governance, in terms of its successes, failures, and overall status.