Space 2006
19 - 21 September 2006, San Jose, California

AIAA 2006-7488

The Cultural Imperative to Colonize Space:

An Astrosociological Perspective

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[Abstract] From the time human beings could adequately comprehend their view of the stars in the heavens, they sought to understand what existed beyond the Earth and their own place in the universe. Early in the history of humankind, the longing for traveling to distant worlds accompanied our determination to understand the universe, perhaps starting with a visit to the Moon. As our comprehension of space phenomena became more sophisticated, so too did our realization that space travel and settlement could occur only after solving numerous difficulties. This sophistication followed applications of rocketry in World War II and the following Cold War. Men and women who as children dreamed of traveling to other planets were put to work building the machines of war and participating in a Space Race. This outer space production has motivated weapons systems and reconnaissance systems used for defense and for making war. However, that production has also sent humans to the Moon and generated much scientific knowledge for the benefit of humanity, to include the reconnaissance about weather and the environmental condition of our planet and a level of technology that allows for cellular phone communication and rapid financial transactions. In these ways, humans have been explorers of the Cosmos. There *is* a cultural imperative to colonize environments beyond the Earth because that is a logical extension of these historical elements. Yet, this cultural imperative to colonize space has slowed in current times. When the Cold War wound down, the years following the United States' Apollo program seemed like a rejection of human space travel to extraterrestrial destinations. However weakly, though, our society still clings to the dream to colonize the Moon and then Mars to learn the lessons necessary to move far beyond both in terms of distance and development. Essential is the vigorous stimulation of this cultural imperative, because *outer space production is key to the survival of the human species.*

I. Introduction: Leaving the Cradle

IT is probably best to start with Tsiolkovsky's famous quote, usually translated as: "Earth is the cradle of humankind, but one cannot live in the cradle forever."§ This sentiment succinctly defines the central argument made here. It refers to the cultural imperative to expand the human presence into new territories in order to allow human populations to improve their social lives. Humans have explored and colonized each of the Earth's land

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§ This quote is taken from a letter written in 1911 by Konstantin E. Tsiolkovsky.

masses though the oceans remain largely uninvestigated.** It is, in fact, something of an irony that space has received greater attention. Some space phenomena are better understood than ocean phenomena of the Earth. And, while the oceans are much closer, humankind has been drawn more strongly toward investigating space phenomena. Why is this so?

The answer to this question involves societal issues characterized by practical underpinnings. Humanity's exploration of outer space is no accident of history. Rather, it represents a logical continuation of social and cultural development. One does not need to explore the ocean floor very much to operate submarines. However, there was a great deal of exploration, knowledge acquisition, and technological mastery involved in going to the Moon to win the Space Race, a major benchmark in winning the Cold War. There is a lot of know-how that has to go into imaging the Earth for technical intelligence (TECHINT) purposes or for the successful operation of weaponry that enters and exits space, in the case of intercontinental ballistic missiles (ICBMs). Much of what we know as the civil space effort is primarily an adjunct or spin-off of Cold War and military aims. When one of the authors (Thomas Gangale) gained the clearances as a USAF aerospace engineer to work in the "Black Sky Air Force", he was welcomed to the "real" space program by his supervisors and co-workers.

The historical impetuses that drove outer space production were tied to discrete events like the applications of rocketry in World War II and the following Cold War. Men and women who as children dreamed of traveling to other planets were put to work building the machines of war and participating in a Space Race. This outer space production has motivated weapons systems and reconnaissance systems used for defense and for making war. However, that production has also sent humans to the Moon and generated much scientific knowledge for the benefit of humanity, to include the reconnaissance about weather and the environmental condition of our planet and a level of technology that allows for cellular phone communication and rapid financial transactions. Counterintuitively, the cultural imperative to colonize space has slowed in current times. When the Cold War wound down, the years following the United States' Apollo program seemed like a rejection of human space travel to extraterrestrial destinations.

What do the authors mean by the term *imperative*? In the present context, it is defined as a rule, principle, or instinct that compels a certain behavior. By *cultural imperative*, we refer to the compulsion of humans who act to understand the universe and their place in it. It relates to the idea that humans feel a connection to the Cosmos; a curiosity that spans the tens of thousands of years of existence on this isolated world. It refers to the strong cultural desire to know the universe on a scale that transcends the individual and that seeks to find a place in the collective consciousness of whole societies. History shows that social groups have organized their beliefs and social structures around space phenomena from the time they could comprehend their existence, even when they could not understand the workings of the universe in more scientific terms. Mythologies that envisioned the planets as gods and goddesses, and the construction of sites like Stonehenge, are good examples of this organization of beliefs and social structures.

In these earlier ways, human groups have sustained a cultural imperative to know the greater environment in which they lived, swayed back and forth by forces of nature or the whims of the gods from their various points-of-view. From these beginnings was spawned a more expansive evolutionary lineage of science and technology. The role of the observation of the planet Mars was critical to the development of calculus, for example.

In time, we came to military concerns that affected the entire globe where strong cultural pressures abounded to achieve permanency in space. From the V-2 rocket that the Germans used to bomb London evolved both the modern designs of ICBMs capable of carrying nuclear warheads to their deadly destinations *and* the Saturn V that carried several human-crewed missions to the Moon. The current phase of globalization upon which the world depends and operates relies on the outer space production that followed World War II.[1††]

What is so evident in our day-to-day lives is written so pervasively in our rapid transportation, instantaneous communications, and virtual communications that the average individual does not see the script, that all of these things are owing to humanity's encounter with the Cosmos: cell phones, satellites that handle financial transactions, advances in weather forecasting, and so on. In a world where people have forgotten, the mental gymnastics required to derive a square root, because they are so dependent upon tiny calculators, how can one expect the average person

** Only about 10% of the sea floor has been mapped, which is the underlying reason why the American nuclear submarine, the *USS San Francisco,* hit a submerged seamount near Guam on January 8, 2005 and was almost lost**.**

†† Arguments against the technological prominence of this assertion advance that multinational corporate and Neoliberal agendas are responsible for the current phase of globalization. And, while that may be partly true, those actors would not be able to "move, shoot, and communicate," to use a military phrase, if not for the technology that makes their aims actionable.

to contemplate how and why those microchips in his calculator emerged? Evidence of outer space production is *buried* in our everyday material culture, and thus it is not present in our everyday consciousness!

Despite our utilitarian reliance on products in our daily lives that owe their existence to the exploration of space, and despite the mystery and intrigue of space and its lure that some people are actively aware of in cultures both East and West, none of that is enough to sustain the levels of outer space production to mount the colonization of Low Earth Orbit (LEO) in massive space stations, a base on the Moon, or a settlement on Mars. Only great threats that shake our ideal-type average person from Earth-bound complacency or a socially conscious effort to instill a wider awareness of outer space production and its necessities will change this course. Failure to explore and colonize space brings with it consequences.

There is cause to worry about humanity's pullback from the Cosmos. A simple social law that seems to operate to this day is that societies prosper when they expand outward in some way, and conversely they decline when they fail to explore unknown frontiers. It is vital that societies expand their presence in the Cosmos, that a significant portion of humanity leaves its cradle, in order to avoid the decline and potential extinction of the entire human race. Whether that occurs or not depends in general terms on humanity's heed of the cultural imperative.

II. The Astrosociological Perspective

Astrosociology refers to the study of astrosocial phenomena (e.g., social and cultural patterns related to space). The astrosociological perspective focuses on human behavior somehow related to outer space. While human behavior represents the phenomenon of interest, space and its attendant features represent the ecology in which this behavior occurs. Currently, very few humans live in space on a continuous basis. Some combination of astronauts and cosmonauts live aboard the International Space Station. With this being the case, most of the astrosocial phenomena occur on the Earth at the present time and will continue as such for a long time to come.

For the most part, the social sciences currently fail to study astrosocial phenomena on the Earth.[2] Sociologists in particular view space as an illegitimate area of inquiry. Not only do they fail to recognize the technology transfers and related spinoffs from outer space production that make societal progress possible, but they also fail to see the long-term trend of space commerce and exploration. This occurs even though every modern sociology introduction textbook extols the impact of globalization. They fail to recognize how the need to explore that characterized societies in the past will likely manifest itself as the inevitability of exploring space.[⌗⌗] The establishment of astrosociology serves to fill the void in sociology and the other social sciences concerning space. It must develop in a way that organizes social scientists to concentrate on an area of inquiry that will become more important to humanity even as it receives very little attention. One significant way that this inquiry may be organized is to bring social scientific concerns into aerospace venues and aerospace concerns into sociological venues.

III. Push and Pull Forces of Space Exploration

All human exploration is motivated by both push and pull forces. Among the earliest hunters-gatherers, over-gathering and over-hunting of a band's annual cycling territory, along with its increasing size, would prompt the fissioning of the band and send members of the original band into new hunting and gathering territories. That was a major pattern of migration over the human landscape for millions of years. The epochal climate change at the onset of the Holocene put in play events that motivated the rise of horticulture, then agrarian agriculture. Population pressures and crop failures then began to push human groups around, while the pull forces of the conquest of new croplands, pastures, and farming peasantry shaped the economics and larger social organizations of the pre-industrial world. The application of mechanized agricultural technology to textiles launched the first industrializing societies.

The need for resources on the decline side of oil and population growth and pressures in a world numbering nearly seven billion people continue the push theme in the human story. Likewise, so is the theme of the allure of new human ecologies that humanity might construct among the wastelands of the Earth or elsewhere in the Cosmos abundant with imagined or potential resources and relief from population pressures.[3] Just how technology will accommodate those themes remains to be seen. Some technological expectations have not panned out. The costs of the waste disposal in the production of nuclear energy, long thought to be a panacea for cheap electrical power, has limited the usage of this resource.[4] Nuclear rocket engine-powered spacecraft and other equipment that would provide the energy needs of humans off the Earth is a vast improvement over chemical rocketry, and it would allow for a permanent settlement on the Moon, for example. However, use of nuclear energy in the space enterprise is

[⌗⌗] This failure, in part, is owing to American sociology's longtime abandonment of evolutionary perspectives that examined societal development over the human timeline and its bypaths.

subject to a great deal of controversy and regulation. If we can extrapolate from the combined effects of the complementary push-pull forces that have driven humanity over the terrestrial landscape, we may count on them to drive us into the Cosmos.

However, a caveat is in order. These forces are by no means consistent in their effectiveness, as they have waxed and waned throughout history on the macro, meso, and micro levels of social reality. At the macro level, for example, entire societies may favor or disfavor space exploration as they might any innovation. Even when a society favors an innovation, it may not have the means to engage with it to any great degree. Space exploration in the United States at this point in history is a lot like those devices seen here and there in ancient history that demonstrate a technology in certain sectors of a society, but that do not seem to "catch on" across more sectors of the society. The Aztecs, for example, had the wheel, but only used it in the construction of toys and in their calendars. There is likely an assortment of mundane explanations for the failure of the wheel to diffuse across other sectors of Aztec society. In the United States, space exploration is hampered by the lumbering bureaucratic mechanisms of a mature government agency (NASA) that moved a lot faster on the issues of humans in space when national security and national pride seemed to depend on it and when it was young and more pliable. When the national space budget was more abundant and stable at a high level from year to year, the technology of humans in space effloresced in American society and spun off terrestrial benefits. In the meantime, space budgets declined and NASA became a different kind of federal agency than what it had been. As a result, Americans have cell phones as a consequence of space technology, but they do not have space planes; they have satellite TV, but they do not have factories on orbit producing better pharmaceuticals in microgravity.

At the meso level, social groups, subcultures, and organizations may encourage or discourage their members to embrace an innovation. Certain religious groups do not like their members to have blood transfusions or partake of vaccines that might prevent disease and save lives. American Academe has become like such religious groups, particularly in such disciplines as sociology where can be found attitudes that research at the convergence of society, space is silly or trivial, and to study that interface will harm the work of the field somehow.

At the micro level, some individuals want nothing to do with space at one extreme while others live their lives passionately extolling the benefits of it. Most people fall in between these two extremes. They feel the influences of the push-pull factors of the disadvantages of the Earth and the allure of the Cosmos, yet they remain inclined to follow their dictates, and they may not be consistently aware of those push-pull factors or view them as the most central aspects of their lives.

On the macro level, discounting the lack of consistency among these push-pull factors, these effects compel humanity to reach for the stars, even if, at present, the pace seems far too slow and uneven for the most enthusiastic of space advocates. More time is required to resolve obstacles that may be indicative of a slowdown in the rate of technological innovation, a theme pursued below.

In addressing how humans have apprehended Mars over the human timeline, two of this paper's authors (Gangale and Dudley-Rowley) have previously discussed a chronology of the human encounter with the Red Planet (see Table 1 below).[5]

Table 1

Gregorian	Era	Period
<40th c. BCE	Mythic	
40th c. BCE	Gymnoptic	Astrologic
6th c. BCE		Cosmologic
1609	Telescopic	Monographic
1800		Cartographic
1905		Photographic
1965	Telemetric	Sporadic
1997		Systematic
21st c.	Humic	

Table 1 represents the different landmarks in time when the planet Mars was envisioned as a deity (mythic); observed by the naked eye to foretell the future and then to make scientific observations (gymnoptic); observed through the telescope in order to write scientific reports, make maps, and photograph (telescopic); observed up close by probes and landers (telemetric), and, that future landmark, when humans will set foot upon Mars.

As Dudley-Rowley and Gangale have pointed out with their example of how humans gained knowledge about the planet Mars, the closer the Cosmos comes to direct human experience, the more our comprehension of our place in it deepens. An irony of this exploration is that as the human knowledge base of the Cosmos has increased exponentially, we find that we move further from our self-perceived center of an increasingly large universe. In the mythic period, people thought they talked directly to gods; in 1911, the astronomical literature held that the Milky Way Galaxy and the nebulae that were known then as the greater and lesser Magellanic Clouds were perceived to be the entire universe. Astronomers and physicists now speak of the multiverse and a very large or infinite number of quantum realities that make up all that exists.

Our place and our encounters with the Cosmos also depend on where our society stands in the world system of societies. The cultural imperative to settle space exists in all contemporary societies in a general sense although each society's culture involves its own unique version of it. Many developing nations focus more on issues of inequality in outer space production. For example, the Bogata Declaration is a claim by equatorial nations to sovereignty over geostationary orbit where many of the world's important communications, weather, and other types of satellites are parked. Beyond the diplomatic arena, developing nations often partner with developed nations, providing "hitchhiker" payloads or small-scale technologies used in space missions. Developed nations regard space as an increasingly important commercial resource, but their large space agency governmental bureaucracies, the realities of governmental funding, and the mechanics in how they function often have a difficult time developing additional commercial interests on the scale of the mature cellular phone industry or satellites several generations along that handle financial transactions.

Still, industrially developed societies are the most space-capable and, therefore, bear the most responsibility for being the most situationally aware about Planet Earth. Without our expansion of our instruments and people into space, humanity could conceivably perish. Scientists who advocate the hardest for outer space production, like the late Carl Sagan, liked to exemplify this possibility with an asteroid or cometary collision with the Earth. And, certainly, that possibility is obvious from the scars and effects of previous impacts on the Earth. Less cataclysmic, but potentially as deadly all the same, will be the more severe or unexpected effects of global warming and other serious environmental factors, and the decline of science, technology, and the arts. Epochal climatic and geographic change owing to global warming and effects of supervolcanoes, tsunamis, and pandemics in an increasingly more populous world require a larger number of minds working on offsets of these problems.

Yet, here in the United States, one of just a few space-capable societies in the world system, the nation that took humans to the Moon, we see shortsightedness, failures of imagination, and an increasing inability to "think outside of the box." Much of this revolves around the resistance to and obstacles to American knowledge production.

An anti-intellectual strain has always run in an undercurrent in American society. The rugged individualist frontiersman with little book-learning, himself a type of "noble savage," has been exalted in the American psyche since the entrée into the New World by European settlers. Anti-intellectualism is alive and well today and currently expressed in the paucity of funding to American schools and postsecondary institutions and in policies that have bottom line agendas.

As the Apollo program wound down, the decline in the United States' educational systems began. Federal funds were diverted from K-12 and Academe. College and university presidents began to manage their campuses in creative ways to work around the loss of federal funding. This set in motion a trend in postsecondary education that attempts to create and maintain science and technology in the United States on the cheap.[6] College instructors at every level, from the community college to the large research university, have been increasingly entrained into the "part-time" work system, and that usually means full-time and over-time work with long commutes among two or more schools and few or no benefits. Percentages of these "sweatshop university, pieceworker professors" form over 80% of the teaching cadre on some campuses, and in the national aggregate, these poorly supplied educator troops number more than 65%.[§§] These are the troops being sent into the field to train raw recruits and to fight against the decline side of oil, the effects of global warming, pandemics, threats to food plenty and security, and the pressures of China, India, and an ever-increasing interdependent world leapfrogging to advanced industrial status. The twenty-first century is so rich in challenges to the human species; it is not a time to set in motion a slowdown in the rate of technological innovation.

These several events converging in a world made much smaller by instant communications systems and rapid transportation and socially interdependent to a degree never before seen is most likely setting the stage for a slowdown in the rate of technological innovation. Such an event is counterintuitive, and it has been counterintuitive every time that it has happened in human history. Patrick Nolan and Gerhard Lenski,[7] following V. Gordon Childe,

[§§] Colleagues from other countries in the world tell us that the diminishment in the value of academicians in their societies is playing out as well. Still, it is striking to see this phenomenon occurring in the United States.

have described these events of innovative downturn that emerge despite the presence of increasing population, increased intersocietal contacts, and a greater store of information available to potential innovators. Under such circumstances, one expects to see the production of higher rates of innovation, especially in technology. However, in rare instances, major technological advances can generate negative feedback that diminishes the effect of the force of the original innovations. Changes in social organization and ideology that were themselves consequences of technological advances can affect a slowed rate of technological innovation and advance.

Nolan and Lenski[8] give the example of the shift from horticulture to agriculture. The plow, like the microchip, created a quantum leap in human production. As an older system of militia that included all of a society's able-bodied men was replaced by professional standing armies, the power of the governing class increased. New ideologies emerged to legitimate the new system that reinforced it and made it worse. The governing class found it easier to extract most of the economic surplus from the peasantry. The peasants, in turn, lost the incentive for innovation, knowing that the governing class would appropriate any benefit deriving from it. In their tenuous position of only having the bare necessities of life, any loss could jeopardize their survival. In time, the governing class no longer had the necessary knowledge and experience with agrarian technology to produce crops, much less make innovations. Nolan and Lenski have summarized the picture,[9] "In short, *expertise and incentive were inadvertently divorced,* with disastrous results for technological progress." How agrarian governing classes dealt with this was to increase warfare and conquest as the best means to increase their wealth. "More than ever before, the resources of societies were turned from the conquest of nature to the conquest of people."[10]

The test of time will bear out if we are currently seeing a slowdown of technological innovation in the United States and the world. Some compelling events suggest that all of the elements are in place or in play: academic scholars and scientists reduced to lives and careers resembling those of migrant farm laborers, wars and occupations as a means to extend the horizons of capital, the inability to prepare and protect a major American city in the face of a bad storm, and a pullback from outer space production.

To make sure that we do not head for a global technological slowdown, the United States, and indeed every space-capable society, needs to re-focus on the science and technology of outer space production. The example of global warming demonstrates the immediate, practical need. Though detection of the approach of this phenomenon is possible through many systematic observations from the ground, its full impact and its concomitant features can only be fully appreciated from space-based systems. Global warming is ushering in the kinds of climatic and geographic changes of epochal proportion that humanity has not seen since the onset of the Holocene. The ability to comprehend fully what is coming could minimize the environmental train wreck that is in motion.

IV. The Future of the Cultural Imperative to Explore Space: Solutions

Perhaps it is to our benefit that Nature is forcing upon us a "moral equivalent" of war by forcing us to fight her. If global warming produces no overwhelming cataclysmic events and offers gradual chains of severe threats and disasters, then there is the chance for humanity to re-focus and reclaim its science and technological vigor before we lose too much.

Several need assessments and recommendations for solutions emerge. The hierarchies of national space agencies need to be "flattened" in order to connect easily with networks in commercial sectors. Seed funding and rapid avenues for partnership need to be available. One commercial enterprise that would be imminently useful is to acquire certain NASA functions and enter the television media market on the scale of a CNN or Weather Channel. In this way, NASA could make itself over as an instrument of planetary situation awareness, what some have termed "global consciousness." With a worldwide viewing audience, public diplomacy for science and technology could make the connection in the minds of individuals between the environment and space and advance the best of American interests.

The innovation required for multi-year sustained long-duration space missions are the same kinds of innovation needed to respond to worsening environmental conditions and their unexpected consequences. Space agencies need the wherewithal, and official expectations to conceptualize, *in depth,* increasingly longer duration space missions -- and "ground-truth" and "test-flight" on orbit inasmuch as possible these conceptualizations. One society cannot support sustained multi-year space missions. Earnest negotiations require enactment to form working day-to-day transnational funding, resources, and expertise relationships that make *sustained* long-duration space exploration actionable.

We need to treat education as if it is among the most important things in the world. This means more funding into our schools and universities and rigorous oversight to see that it is spent for its instructional and innovation purposes. Teachers and professors need no pampering, but they do need job security and the resources to train those who will succeed them in teaching subsequent generations and in the research activities that create innovations and

accelerate its rate. Deliberate attention needs to orient students to the condition of the planet and the connections between space and the terrestrial environment.

Certain disciplines that often get the least funding of all in postsecondary institutions need reinvigoration. The future of space exploration and the changes that are coming in our terrestrial environment absolutely require the application of the social sciences and the humanities. This flies in the face of the *status quo* where even life sciences money for national space concerns in the United States is limping along on "keep alive" funding. The social sciences have long utilized research findings to improve the human condition. These issues need to be brought to bear on issues of space and the environment. While space exploration does indeed require the training of space scientists, mathematicians, and engineers, it will also require the training of social scientists who specialize in astrosociology in the future (Pass 2006).[11] For example, social scientists will need to participate more inclusively in space research to help plan and operate elements of a planetary defense system as experts tell us that a killer space object will inevitably strike the Earth at some point in the future. How can societies ensure their survival and continuity following an impact should our defensive efforts fail? Another example involves colonization itself. If we construct physical space habitats, we must also construct societies to operate within them (Pass 2006).[12] The social sciences will only become more relevant as the twenty-first century unfolds.

V. Conclusion: Developments

The authors are watching two commercial ventures and their projects with great interest because they fit within the things we view as providing solutions. The Space Island Group,[***] based in West Covina, California, is currently pursuing a $200 billion, 20-year energy purchase contract from India and/or China this year, five percent of which will cover all of the group's space-based project development and launch costs. In addition, the group has asked for a $10 billion grant from the World Bank. This level of funding allows for getting substantial amounts of materiel up to low Earth orbit (LEO), engage in energy production and manufacturing pursuits there, and deliver them to consumers. Among other goals, the aim of the group is to supply half the world's electricity generation and distribution, currently a $2 trillion annual market. They plan to accomplish this, early in the next decade by placing huge, mile-wide sheets of solar cells in Earth orbit. These NASA-designed structures, will convert sunlight into electricity, then use weak, pollution-free, environmentally safe microwave beams to send that energy down to simple antennas anywhere on Earth. The antennas will convert the beams into electricity and feed it into standard existing power grids at an extremely low cost. The system will operate 24 hours a day, seven days a week, overcoming the drawback of rooftop solar cells and windmills. One part of the Space Island Group agenda calls for building large, commercial space stations to house their solar satellite assembly and maintenance crews which could number several thousand space-based workers.

Another company that we are watching is Space Synapse, Inc.[†††] headquartered in Dublin, Ireland, which is a small firm being cultivated by the European Space Agency. Space Synapse, through a combination of art principles and high technology, hopes to convert the International Space Station over into an information portal at the heart of which resides a functional art object. Many rich connections in the form of fixed and mobile facilities on Earth would allow a larger global audience to experience high fidelity experiences of what it is like to live in space and perceptions of the Earth from space. On one hand, it is a large-scale artwork – probably the largest in human history -- because of the need to design rich connections to accomplish its goal. On the other hand, it more fundamentally represents a global public diplomacy project that seeks to raise the situational awareness of people everywhere and our role as riders on Spaceship Earth.

We are additionally watching (and participating in) two other developments. One is budding attempts in the United States and Canada to convert untenured faculty to tenure-equivalent positions so that professors can teach and innovate with some measure of security in their lives and careers. Similar developments in this vein are the movements within states to force colleges and universities within their borders to comply with state laws concerning higher percentage levels of tenure-track hires.

The second development that we are very much participating in is the formation of a domain of sociology that we have termed "astrosociology." Additionally, astrosociology consists of scientists in the other social and behavioral sciences as well as the humanities. We believe that astrosociology can make significant practical contributions to the state of human affairs by addressing astrosocial phenomena both on the Earth and in space. As author Jim Pass wrote, the practical aspect of astrosociology, *applied astrosociology*, entails:

> …the application of astrosociological knowledge (i.e., information derived from astrosocial phenomena) to astrosocial phenomena in a manner consistent with improving [conditions] for the betterment of (1) space exploration and potentially

[***] For more information, go to their website at URL: www.spaceislandgroup.com.
[†††] For more information, go to their website at URL: www.spacesynapse.com.

(2) other aspects of a particular society. In other words, applied astrosociology involves the use of theory and research to solve real social problems related in some way to astrosocial phenomena (Pass 2005).[13]

With the natural world changing around us, the cultural imperative of space exploration and colonization, and those things that connect to it, will make direct connections to the application of practical solutions to human social problems wherever humans exist in the Cosmos.

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