

Developing Astrosociology for the Space Sciences¹

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Abstract

With the end of the shuttle era approaching, the space program continues to utilize engineering and space-science approaches oriented toward solving relatively simple problems related to near-Earth missions. Achievements in the future will involve much more complex objectives related to the various facets of engineering, the space sciences, and, increasingly, the social sciences. Undeniably, the discipline of psychology was incorporated early in the space program primarily for screening and fitness evaluation reasons, and included the psychological/engineering approach known as “human factors.” Overall, however, the other social sciences received few opportunities to contribute since the dawning of the space age. This avoidance of the social sciences cannot continue much further into the future. As human space programs seek to venture beyond low Earth orbit, the need for input from the social sciences becomes more relevant and vital for success. The impact of space activities on terrestrial societies remains largely unexamined while the development of human societies beyond the Earth involves social phenomena the space community is unprepared to address. The space community must begin to consider a new collaborative approach that includes the space sciences and the social sciences. Astrosociology offers the promise of a new multidisciplinary field that gives new meaning to the phrase “exploring together” as it can serve as the catalyst for collaboration among all scientists, engineers, and other interested parties. The construction of an astrosociological body of knowledge and its related literature possesses the great potential to bring in the concepts, principles, and findings of sociology and the other social sciences for use in future missions and projects. Developing astrosociology for the space sciences will bring about a great expansion of knowledge and a more balanced understanding of space and its relationship to humankind as well as its social systems.

Introduction: A Space Age in Our Own “Backyard”

With the exception of the Apollo program, the human spaceflight program during the entire space age has focused on activities occurring in low Earth orbit. With this focus, NASA

and the Soviet Union/Russia were able to accomplish a great deal of research and learn much about human physiology in space. Many of the issues related to psychology were also incorporated into these space programs. A great concern from the beginning of both space programs involved questions relating to the ways in which the space environment affected the human mind. At first, there was a fear that humans could not cope with an ecology characterized by “weightlessness” and close confinement. Since the beginning of both the U.S. and Soviet/Russian space programs, it is fair to state that psychologists have represented the most directly-involved non-natural scientists in these space programs. The others have been absent for the most part.

Thus far, *human spaceflight* objectives have been rather modest with a long period of inactivity beyond low Earth orbit. The flights have been rather short in terms of distance from the Earth and all of them have been temporary in duration. In essence, during the course of the almost fifty years that comprise the space age to this point, humanity was content to “play in its own backyard.” Only robotic missions have operated beyond the Earth-Moon system thus far. To be fair, the short distance traveled by humans in space should be considered in light of the accomplishments. The six Moon landings were indeed impressive, for example. However, the last moon landing occurred approximately 35 years ago! Potentially, the new Crew Exploration Vehicle (CEV) and related programs of the President’s Vision for Space Exploration (VSE) will get humanity back to the Moon and then to Mars. As this occurs, we should take advantage of acquiring social knowledge that can benefit humanity’s ability to move even farther into space on a permanent basis. In the process, we must be mindful of the likelihood for a significant reduction in the space science projects unrelated to spaceflight. Ultimately, human spaceflight and robotic missions will each require input from one another.

Of greatest interest here involves (1) the history of the *space age* as it relates to how the absence of the social sciences impacted on the space sciences and (2) the future as it relates to the interaction between the social and natural sciences. One of the main contentions of this paper relates to the idea that humanity cannot move very far beyond its own backyard without greatly increased levels of formal input from social and behavioral scientists, humanities scholars, and even artists (hereafter referred to as the *social sciences* for brevity). A question to ponder, then, is: why do space scientists and engineers need the input of social scientists?

Why does the space community need astrosociology at all? Why should an engineer or space scientist care about the social sciences when they have done fine without them (aside from psychology) since the beginning of the space age? [W]hy do members of the space community fail to see the value of the social sciences in furthering their objectives? ... The answers to such questions seem unapparent to many. After all, NASA *has* achieved a great many successes without a great reliance on the social sciences. Thus, many question why the social sciences deserve consideration now. Space scientists and engineers have worked within organizations, both directly in space and indirectly on Earth, to make the space program possible. Politics always influences their work, but social scientists seem irrelevant (Pass 2005b).

The answers to such questions, assuming of course that social scientists are indeed required, may be found throughout this paper.

Before we venture too far away from our *backyard* (i.e., the Earth-Moon system), the social and space sciences will need to prepare themselves to collaborate with each other. We cannot get very far without all the relevant sciences working together. “Developing astrosociology for the space sciences” involves two major elements: (1) successful development of astrosociology within sociology and throughout the social sciences and (2) creation of a formal and permanent collaborative relationship between the space community and the social science community represented by astrosociology. Development of astrosociology will actually result in the further development of the space sciences due their access to astrosociological data

and its incorporation into their research. At the macro level, such knowledge was unavailable for the most part in the past.

This paper seeks to make the case for both the development of astrosociology and its bridging of the *great divide* between sociology and aerospace (Dudley-Rowley 2004) in a way that makes possible the creation of a new body of *astrosocial knowledge* (to be defined later) in which ideas relevant to both space *and* society come together to forge a new understanding heretofore impossible to synthesize. As we prepare to go back to the Moon and then on to Mars and beyond, we must build our knowledge base so as to make possible the eventual construction of *space societies* (i.e., the creation of self-sustained social environments in space). In addition, the transformation of terrestrial societies into spacefaring societies involves a new area of study not as relevant in the past, or at least not as necessary to carry out a space program in our own backyard as conducted thus far. Social scientists will be needed to participate in such a future as we expand our presence in space due to their expertise which space scientists lack. We cannot



continue to do things the same way as in the past and expect the same level of success. It is time to collaborate, and the new field of astrosociology can serve to bridge the gap of the great divide between the social and space sciences.

This paper also seeks to expand upon the general arguments found in this introductory section. Discussions about “space societies,” “spacefaring societies,” and “futures studies” will serve as notable concrete examples in later portions of the paper that demonstrate the need for the two communities to cooperate. Formal collaboration is indispensable in creating the proper social and scientific environments for humanity to venture outward into space in a successful and sustained manner.

The Missing Social/Behavioral Component

The preceding introduction makes clear that an important social component is virtually missing in our general approach to understanding the cosmos. Because astrosociology is the study of *astrosocial phenomena* (i.e., social and cultural patterns related to space), its importance lies in its focus on the relationship between space and society or, in the space programs around the world, between the uncommon social component and the historically emphasized physical component. By the latter, I refer to the nearly unwavering focus on space by the natural sciences and the nearly complete avoidance by the social sciences. I coined the term *astrosocial* to emphasize the connection between the social and the physical; that is, between space and society. Astrosociology now exists to fill the vacuum within the space sciences related to studying this relationship which currently finds itself largely ignored and overwhelmingly controlled by the natural sciences. Due to this reality, the purposeful integration of the social scientific knowledge into the current body of knowledge created by space scientists represents a critical need. The

very existence of astrosociology implies that a formal collaboration should develop along with this new field.

The addition of the social sciences fills an extraordinary void (Pass 2006c) that required action before now, though it will become even more crucial as we move forward.

...I argue here that something significant is missing. Without substantial input from a sociological [and generally a social science] perspective adding insights from its absent worldview, a full understanding of space exploration remains impossible. [For example, t]he traditional subdiscipline of sociology offers important findings, principles, and concepts easily applicable to the new subfield of astrosociology. While such knowledge is familiar to sociologists, the same cannot be said for scientists outside of the discipline, and especially for scientists with backgrounds in engineering and the space sciences (Pass 2006c:7).

There is nothing wrong with natural scientists studying space phenomena, of course. The point is that the social sciences have much to offer, which is currently becoming more obvious to natural scientists and engineers, though this social knowledge during the space age has rarely found its way to studies sponsored by governmental, educational, or private organizations. The exceptions to this general rule are few and the results are poorly distributed for the most part.

While it is true that space scientists and engineers often speak of social and cultural implications of their work and possible findings (e.g., discovery of extraterrestrial life or a new Earth-like planet), these comments usually represent tangential ideas apart from their everyday experiences as natural scientists. Why is this reality dominant? Asked another way, why have the social sciences (apart from psychology) both avoided the study of space *and* become ostracized by the space sciences? The social component is indeed absent, so we must ask ourselves why. The blame may be assigned to both the natural sciences *and* the social sciences.

Perhaps the most obvious reason relates to the erroneous idea that space is not really the domain of the social sciences. After all, it may be argued, the study of space phenomena by astronomers, astrophysicists, cosmologists, and even astrobiologists makes a lot of sense. Space

scientists belong to the large subculture consisting of the natural sciences (which includes the physical sciences). *Natural* scientists should be the ones who study *natural* phenomena. On the other hand, as social life moves beyond the Earth, it should be social scientists who study the behavior of human beings in space. Each major branch of science should study its own domain; share relevant information with the other; and moreover, each should rely on the other for a good understanding of relevant elements of the other domain (Pass 2006b). Their complementary findings can assist in our ability to understand humans in space in a more comprehensive way.

The social sciences are pejoratively called the “soft” sciences by natural scientists due to their perception that social scientists possess fewer rigors than the “hard” sciences (Harrison 1997). In fact, however, both exercise the same scientific method. Moreover, while the “hard” sciences study inanimate phenomena and processes which tend to follow more identifiable laws of nature, the “soft” sciences must study and understand human behavior, a general topic in which the subjects of study can manipulate their own environment. For such reasons, many social scientists regard the “soft” sciences as the “harder” sciences. Their subjects, human beings, are not inanimate objects but intelligent living creatures who reflect on their own behavior. These subjects can change their behavior due to their ability to adapt to new conditions and changing circumstances. They can even recognize the intrusion of researchers and change the course of their planned direction. In contrast, for example, asteroids cannot change their course to avoid the scrutiny of astronomers or their space probes. Social scientists will become more important as a greater proportion of the Earth’s population moves into outer space and terrestrial societies incorporate additional spacefaring characteristics. For one thing, we will need to develop space societies (i.e., colonies and settlements) that can survive on a long-term basis (Pass 2006b).

As we near the fiftieth anniversary of the dawn of the space age, it seems well past the time to formally invite the social sciences into the space club. *The associated reasons for this new reality relate both to the missing knowledge from social scientists from which space scientists cannot benefit (due to its absence) and the changing nature of space exploration in the future.* The missing social component represents a weakness in our understanding of humanity's relationship to space. Now is the time to begin a dialog between the two branches of science and thereby reap the benefits of collaboration between the two as our research yields findings of greater significance to humans and their place in the cosmos. The general idea of the missing social component, which implies the absence of a social science perspective related to outer space, serves as a major theme of this paper.

Astrosociology as a Sociological Subdiscipline

The development of astrosociology requires a two-pronged approach as (1) a subfield of sociology and (2) a multidisciplinary field (Pass 2006c). The first facet receives brief attention here while the second facet receives greater attention in the next subsection and beyond. As important as a multidisciplinary field may be, sociology has much to offer the social sciences.

The term *astrosociology* implies the need to develop this area of study as a formal subdiscipline of the sociological discipline. It was never developed successfully in the past, so I simply declared its existence with the launch of my website called *Astrosociology.com* and the posting of my two-part *Inaugural Essay* (Pass 2004a, Pass 2004b). Sociology has much to offer our understanding of space phenomena due to its unique focus upon human behavior in a social context. If humans expand their social structures and cultures into the new ecology called "outer space," this would represent a largely unexplored area of sociological inquiry. Therefore, the

development of astrosociology makes logical sense within the sociological discipline although this outcome is by no means a foregone conclusion.

Does my call for the establishment of astrosociology represent a self-fulfilling prophecy or a fool's errand? No one can predict the future. Nevertheless, the void in sociology's coverage of social phenomena requires addressing. If astrosocial phenomena reflect ignored yet significant social patterns, then the self-fulfilling prophecy scenario correctly predicts the future course of this endeavor. Yet interested scientists need to participate in order to ensure success because one only knows that a self-fulfilling prophecy has occurred after its conclusion! (Pass 2005c:12).

The fact that sociology has largely ignored astrosocial phenomena during the entire course of the space age seems to indicate that it lacks legitimacy along with a number of corollary rationales to support this pattern.

Many critics undoubtedly view astrosociology as pseudoscience and thus as somehow nonscientific. A similar problem faced SETI several years ago (Harrison 2005). Within the discipline of sociology (and within the other social sciences), this problem still represents a major obstacle to overcome. In a paper delivered at the California Sociological Association (CSA) conference in 2004 called *Space: Sociology's Forsaken Frontier*, I made the following observation regarding this problem.

Negative reactions result from the mention of "space" (especially "outer space") partially due to the improper association by some critics between the term *astrosociology* and some or even all of the so-called "pseudosciences." These critics argue that astrosociology must focus on the several pseudosciences that relate to space in some way including astrology as well as paranormal topics, alien detections on or near Earth, alien abductions, UFOs, crop circles, and cattle mutilations (Pass 2004c:22).

The fact that the SETI community triumphed over this irrelevant objection provides a great deal of hope for astrosociology to do the same. An early task for me as the first astrosociologist had involved determining each of the major objections to astrosociology, including its lack of

legitimacy, so I could deal with each of them on a straightforward basis. Other astrosociologists have joined the community though the criticisms within sociology continue to some extent.

Despite objections and indifference, the fact remains that astrosociology is gaining traction within the sociological community. In the end, I strongly suspect that sociology will prove an extremely valuable perspective within astrosociology. Until, then, sociologically trained astrosociologists will need to make the case for the study of astrosocial phenomena.

Astrosociology as a Multidisciplinary Field

Almost immediately following the inception of astrosociology, it became clear to me that astrosociology had to expand from merely a sociological subfield into a multidisciplinary field. While it remained vital for it to develop as a sociological subdiscipline, it had to simultaneously develop as a subfield in each of the other social sciences as well so it could (1) coalesce into a single social-scientific field and (2) gain recognition from space scientists and engineers. Should such a development occur within the social sciences, a formal collaboration could begin with the space community.

Roots in multiple scientific fields and other areas of social life can help to provide a greater foundation for a new field. Potentially, space advocates can serve as an additional source of support for astrosociology. If astrosociology can become a generally recognized field within both scientific and advocacy groups, then its chance for successful development increases. And, of course, many of the strongest advocates are in fact space scientists and engineers. For such reasons, I felt it was important to address this space advocacy/space enthusiast audience. I am gratified that my paper was accepted for presentation because it allows me to introduce the field of astrosociology and explain the significance of the social sciences to space enthusiasts.

Reviewing current circumstances from another viewpoint, two fundamental problems account for the dearth of social science research related to space: (1) the near absence of social scientists (especially sociologists) working in the area of space research and (2) the nearly complete separation between the aerospace and the social science communities due to the *great divide* between the social sciences and aerospace. These issues require examination due to their influence on limiting the potential of a comprehensive scientific understanding of space and its relationship to human societies. Both problems were introduced earlier.

First, sociology even now remains largely indifferent about the study of space exploration. Even today, astrosociologists face an uphill battle within sociology. Work has been done in the area of space research within sociology though the work is scattered over time and unconnected. It tends to come to light as a reaction to a tragedy or social problem of some kind such as a shuttle accident or series of NASA mishaps. Most notably, space-related sociological research occurs within the subfields known as “the sociology of science and technology” and the “sociology of organization.” Such studies are rather uncommon, however.

The work of other social scientists/humanity scholars such as psychologists, political scientists, anthropologists, economists, historians, and increasingly communications is a bit more extensive, though still largely unorganized. As a multidisciplinary field, astrosociology can unite these isolated scientists together so they may contribute to a single body of knowledge and its related literature. The value of this binding of social scientists cannot be overestimated. It represents the most effective path toward the establishment and development of astrosociology as a legitimate, accepted field for both sides of the great divide between the social sciences and the space community. Unless the social sciences can coordinate their efforts in their study of space issues, they can never hope to develop a widely recognized literature.

Second, Marilyn Dudley-Rowley (2004) wrote about the concept of this great divide between aerospace (or the space sciences and engineering disciplines) and the social sciences, especially as applied to sociology. Along with uniting the social sciences, astrosociology can also improve the quality and safety of humans in space (and on the Earth).

Any time we expand the human ecology, the experience is a hard one for us. More people are bound to die, even with sociologists and others looking out for them. That is the nature of humans exploring frontiers. However, bringing sociology together with the aerospace enterprise will minimize the risk that humans face in their encounter with the Cosmos (Dudley-Rowley 2004:8).

I have characterized this process as “bringing sociology (and the other social sciences) into the space age.” The increase in safety that accompanies the collaboration of space scientists and engineers with social scientists must become a well-recognized benefit along with the others.

The **solution** to these two problems, while not surprising based on the discussion thus far, may be characterized as the development of astrosociology as a (1) sociological subdiscipline; (2) multidisciplinary field encompassing the other social sciences, humanities, and the arts; and a (3) recognized “social science” field by the space sciences and engineering community. This solution therefore involves a formal collaborative structure between the two communities or metaphorically, utilizing astrosociology to bridge the great divide. While this seems like a rather ambitious goal, I maintain that it remains fundamentally necessary in order to understand the increasingly important relationship between space and society, including the knowledge necessary to move large populations of human beings into space on a long-term (or permanent) and isolated basis.

To accomplish such goals, space scientists will require assistance from social scientists since they specialize in human behavior in a social context. Old patterns of isolation between the two cannot continue. “Thoughtful and effective collaboration among physical, biological and

social scientists may break down the barriers that separate different intellectual fields and move us towards the unification of knowledge” (Harrison 2005:15-16).

When the space sciences and engineering [disciplines] (nearly exclusively favored by the space community) and social sciences (reflected by astrosociology) cooperate, we can move forward into the future in a way that makes us better informed, better prepared, and more capable. Astrosociology can serve to bridge these two currently isolated factions in a way that favors collaboration and greater success as we make our plans to move farther outward to explore space. Independently, each community fails to attain a full understanding of the relationship between space and society (Pass 2005b).

If astrosociology does indeed become a multidisciplinary field within the social sciences and one recognized as worthy of collaboration by space scientists and engineers, then all the issues involving the relationship between space and society will finally receive ongoing, formal attention so that we may ensure a more productive future in space.

Humanity in Space and Social Knowledge

Earlier, I mentioned the idea that one of the reasons for astrosociology’s relevance relates to the changing nature of space exploration. To be more precise, while robots serve as the vanguard for human exploration helping us to understand the wonders and dangers of the space environment as well as for locating interesting physical environments to study in person, it seems extremely likely that humans will follow these machines outside of our backyard. Human exploration will likely occur to satisfy our cultural curiosity of unknown places and phenomena. Additionally, space travel, exploration and exploitation of space, settlement, and work in space will occur so as to expand terrestrial social structures into this new ecology. We will expand our economy into space (including leisurely pursuits such as tourism). Humans will need to devise ways to work and play in this expansive though dangerous environment. The new knowledge

necessary to realize such a future reality will involve a synthesis of information from the social and natural branches of science.

The *sociology of knowledge* is the study of the social origins of ideas and of the effects prevailing ideas have on societies. This sociological subdiscipline examines the social sources and social implications of knowledge for a society's social structures, its larger culture, and its subcultures. Ideas, or elements of social knowledge, are *social facts* (i.e., measurable social patterns) that serve as social forces contributing to social change. Knowledge is necessary for understanding a particular set of phenomena, of course, but it also makes possible the ability to engage in activities forcing change on an individual basis (i.e., at the micro level).

Space Sciences as Astrosocial Knowledge

Social knowledge may be defined as all the information gained within the subjective cultural environment characterizing a particular society. This information includes objective facts learned in school and elsewhere, but also subjective beliefs usually consistent with one's culture and personal experiences. In today's globalizing world, it is vital to include ideas, cultural and social patterns, and customs influencing us from exogenous sources (i.e., other cultures). A substantial source of social knowledge comes from the space sciences and engineering (i.e., astrosocial phenomena).

The space sciences continue to make discoveries that influence human societies. These discoveries, and even the theories that predict them, contribute to features of social organization and social change. Astrosocial phenomena interact with other social phenomena resulting in new emerging patterns. Astrosocial change affects space exploration as well as other parts of society, and thus this area of research is long overdue.

Astrosocial knowledge is defined here for the first time as all the information gained about astrosocial phenomena within the subjective cultural environment characterizing a particular society, including the influences of external cultures impinging upon that society from the outside. The concept of astrosocial knowledge constitutes a subset of social knowledge. Its separation represents an important development as a focus of astrosociology and additionally as a neglected area of research common to all sciences previous to the creation of this new field.

Historically, astrosocial knowledge has received relatively little attention compared to social knowledge focusing exclusively upon space phenomena. We seem more interested in discoveries related to astronomy at their face value though not so keen to examine how these types of discoveries affect a particular society's culture and various social structures.

Astrosociology seeks to change this social reality by focusing on the intersection of space phenomena and social phenomena. Indeed, the concept of *astrosocial phenomena* was conceptualized for precisely this purpose.

Astrosocial knowledge possesses value in its own right, but it also infers implications for applications relevant to the solution of social problems and, more generally, for the alteration of social conditions related to improving the human condition (Pass 2006c). Historically, scientific discoveries and technological breakthroughs in the past have improved the living conditions of human populations throughout the world. Arguably, the contributions of the space sciences and engineering disciplines typically remain extremely understudied by social scientists, outside the scope of the natural sciences, and underexposed to the general public. The potential benefits generated by astrosocial phenomena for each of these parties receive attention next with the assumption that the contemporary scientific indifference toward them disserves the two major branches of science as well as the existing terrestrial societies around the world.

Applied Astrosociology and Solution of Social Problems

Sociology and the other social sciences exist not only to understand how societies and their cultures operate, but also to apply this social knowledge toward useful practical outcomes. Karl Marx called this *praxis* or the translation of an idea or set of ideas into action (Marx and Engels 1976). Marx argued that people can make their own history in addition to their susceptibility to material and social conditions. He referred most directly to the possibility of human beings overcoming the alienation they experienced and thereby ridding the world of oppression, but the concept of praxis may be expanded to the general idea of applied sociology.

Praxis involves the close interaction of theory and practice, something that many early sociologists found problematic. As the discipline of sociology developed approximately two hundred years ago, it developed a critical schism between the early sociologists who favored an applied approach versus those who called for a theoretical orientation. It started with the European sociologists first and then became an important source of contention among American sociologists early in the twentieth century. In general terms, the theorists won this debate as sociology became a theoretical science though applied sociology still exists as an important component of the discipline. While it is important to *understand* social problems, it is perhaps more essential to attempt to *solve* them through the application of social knowledge produced by the social sciences.

Based on this practical orientation, the space community should begin to recognize the value of collaborating with social scientists specializing in the study of astrosocial phenomena. Ironically, however, it remains critical for the social science disciplines themselves to accept the field of astrosociology as a necessary and legitimate area of theory and research. Practical applications made possible by theory and research produced by both the space science and social

science communities require cooperation between the two. Below I recently criticized my discipline of sociology for its failure to address astrosocial phenomena, but the same criticism may be directed at each of the social sciences.

Many enduring terrestrial social problems actually lend themselves to the types of solutions most common in the space sciences and engineering fields rather than other elements of society. It makes no sense to overlook any source that can provide possible solutions to our seemingly intractable problems. Yet, as members of the sociological discipline, we continue to do just that (Pass 2006c:10).

As may be apparent, my efforts to develop astrosociology involve the simultaneous goals of convincing both space scientists *and* social scientists to accept astrosociology.

Applied astrosociology may be defined as the application of astrosocial knowledge to the solution of social problems relevant to both space concerns *and* all aspects of terrestrial social life (Pass 2006c). The problems in question may exist as those involving the space community *or* those involving the social lives of individuals on the Earth. Applied astrosociology represents a variant of applied sociology in which space assets including knowledge, material culture, and human groups are utilized to solve an identified social problem (Pass 2006c). In time, applied astrosociology will likely include attempts to solve problems of social groups in space (i.e., crews or scientific groups) as well as space societies (i.e., colonies or settlements in outer space). For now, its most important applications almost exclusively center on the problems found in our own “backyard,” most often manifested as on the Earth.

Thus, applied astrosociology represents a lofty goal because it can yield benefits for the exploration/utilization of space *and* for the solution of terrestrial social problems that seem to linger without much mitigation as things current stand.

The space sciences can offer unique solutions to many social problems, and that assists their cause...As one example, the finite resources on Earth make it attractive to consider the mining of space-based resources (Hardersen 1997;

Lewis 1996). Space represents a new economic frontier with untapped potential that inevitably draws greater attention. As [terrestrial] natural resources decline, the shift to space resources represents a logical new focus for economic activity. At some point, the benefits outweigh the costs as science and technology continue to advance (Pass 2004b:24).

I believe that it is much better to implement applied astrosociology proactively rather than wait until our various social problems escalate to the point at which social scientists are hastily brought in, forcing them to make up for lost time in their collaboration with the space scientists seeking to deal with these problems on their own. Even worse, the space community may largely ignore social problems on the Earth, disregarding them as unrelated to space. Practical benefits to involving the social sciences in space exploration certainly would exist at the exact point at which social scientists were given the opportunity to contribute in a formal manner.

Space Societies as a Future Pattern of Emigration

The emigration of humans from the Earth to locations in outer space must receive its due attention based on the real likelihood that such a social pattern will indeed emerge. For one thing, this pattern makes logical sense as a contributor to the solution of problems involving overpopulation on the Earth and protecting our species should an asteroid or comet strike it. Space societies, while an important issue, receives brief attention here due to the limited focus upon applied astrosociology and the requirement for collaboration between the space and social science communities.

A definition is certainly warranted, however. “[A] *space society* is defined as a space colony/settlement in which members of the population (1) share a common culture, (2) live within a closed physical environment, and (3) cooperate with one another, social groups, and institutions in order to meet the social needs of all its citizens” (Pass 2006a:4). The tradition of

sociological inquiry regarding the study of terrestrial rural and urban environments can offer many insights for those constructing social societies. The same may be said about the other social sciences as well.

One of the most important points regarding space societies involves the fundamental emphasis upon the social environment. Historically, this is one area that receives continuing inattention among space scientists and engineers. Since most of our human spaceflight occurs in our own backyard, the need to collaborate with social scientists seems almost irrelevant to them. So far, the types of individuals going into space may be characterized as elites both in terms of professional astronauts or privileged (i.e., wealthy) individuals from other walks of life. In the middle-range future, populations will live farther away from the Earth, remain permanently on another cosmic body, and number in the thousands. Even now, we need to prepare ourselves for the step-by-step process that will take us from a reality of no space societies to one in which such social structures abound.

If we truly intend to develop a space colony, we should remember one fundamental rule: *construction of the social environment is just as important for survival as construction of the physical environment.* The *social construction* of a space colony refers to the idea that settlements in space involve the creation of a social environment in addition to the physical environment (Pass 2006a:2).

Aerospace engineers will need to work with applied astrosociologist so they may develop a physical environment that is conducive to the needs dictated by the social environment.

A most beneficial outcome produced by collaboration is the new social knowledge that would otherwise not exist.

Consequently, a major focus on the social environment requires bringing sociology and the other social sciences into the mix in addition to developing astrosociology as a banner under which sociologists and all interested scientists can collaborate in an organized manner in order to build a coherent body of knowledge and related literature. Formal collaboration between astrosociologists and space scientists/engineers can serve to provide all those involved with a well-

rounded understanding of all the issues involved with constructing a space society (Pass 2006a:3).

The very complexity of a space society requires both space scientists *and* astrosociologists to contribute unique insights from their areas of expertise in order to construct a space society that survives both in terms of both physical environment *and* the social environment.

Two conclusions may be made concerning the construction of a space society. Although we possess no experience in doing anything like this beyond space stations circling the Earth, we can safely predict that true space societies will involve a much greater challenge.

The major two themes underlying the contents of this preliminary essay are as follows: (1) the social environment, though largely ignored by space scientists and engineers (and even by the sociological discipline), is just as vital to the overall success of a space colony as the physical environment and (2) the importance of the social environment necessitates scientists in the physical and social sciences to strongly collaborate in order to ensure overall success of any space settlement without regard to its population size (Pass 2006a:7).

Such a challenge will require both communities to work together on a long-term and permanent basis. Applied astrosociologists will provide the missing expertise necessary for this task even though it was not needed previously.

Collaboration must exist to construct a fully functional and survivable space society. Together, the physical and social environments combine to meet the biological and social needs of the settlers. In order to reach such an achievement, it will be necessary for specialists in applied astrosociology to work with space engineers starting with the simplest habitats and continuing on toward the construction of more complex space societies in which thousands of colonists live together far beyond the Earth. The progression of sophistication of the physical and social components of space societies along a continuum requires the inclusion of applied astrosociologists from the very beginning. Only a collaborative approach between the two sides of the great divide can yield steady progress.

Spacefaring Society as the Next Great Social Transformation

While part of the human species emigrates from the Earth, those left behind will continue to advance in the areas of science and technology, institutional differentiation and reform, and in other areas of social life. The overall direction taken by humanity remains an important area of study in this present context as will be discussed momentarily. Space is very likely to play a significant role in our development as a species as well as the development of our societies. Astrosocial change, a specific type of social change, must be evaluated as a significant process, especially due to the fact that space will become more omnipresent in our lives and due to its great potential for solving social problems.

The contributions of astrosocial phenomena to social change (i.e., *astrosocial change*) continues to affect society and culture, so why not take advantage of these trends for planned interventions involving ongoing terrestrial social problems? While much astrosocial change occurs to solve specific space-related technological and scientific problems, the solutions it produces often possess wider applications relevant to other segments of a particular society (Pass 2006c:9).

Astrosocial change impacts upon the elements of space and aerospace, but it also contributes to changes within non-astrosocial institutions and social groups. All branches of science have largely ignored this impact upon society, though it will become less possible to do so as progress continues, and astrosociology will fill the void by producing astrosocial knowledge.

The last great social transformation involved the shift from agrarian societies to industrial societies. Many would argue that the shift to a service economy is nearly as important. But what will the next great social transformation look like? I have argued in the past that perhaps the next great social transformation will involve our transition from a service economy to a spacefaring society. If, indeed, space assets can assist us in solving some of our most intractable social problems and there truly exists a cultural imperative to explore space, then the transition

into spacefaring societies seems extremely logical. Ultimately, with the continuation of the process of globalization, a spacefaring civilization that includes all of humanity may develop.

While the term “spacefaring” is currently used loosely by the lay public, media, and even space professionals, I strongly insist that it should be reserved for a more concise and special conceptualization that is currently absent. Today, even the most advanced societies may be viewed as *space-capable societies* and not spacefaring societies.

As a contrast, a *space capable society* is defined here as one that can reach space on its own accord (e.g., the United States, Russia, ...China...). However, a *space capable* society is not necessarily a *spacefaring society*. The latter represents a significant hypothetical outcome worthy as a major area of concentration under the scope of this new... [field of astrosociology] (Pass 2004b:14-15).

The definition of a spacefaring society involves a theoretical set of socioeconomic conditions unseen during any point in history thus far.

...a unique set of social conditions typify a spacefaring society. Every major institution is highly involved in some way with carrying out space policy as a high priority, and thus space law is well developed. A space-based economy flourishes, for example. Astrosocial phenomena are highly pervasive and vital for the society’s survival. Space issues are intertwined in a multitude of ways into the everyday social interactions taking place in subcultures, social groups, organizations, and institutions. The larger culture reflects the importance of astrosocial phenomena through their incorporation as highly important values, strong norms protecting them, and their omnipresence in a space-dominated material culture (Pass 2004b:17-18).

The following passage attempts to demonstrate how remarkably far we currently stand from the establishment of a spacefaring society.

Consider the rough comparison of a contemporary space-capable nation’s level of space exploration to that of a European nation at a similar stage of sea exploration (long preceding its glory days of discovery). Such a nation would be floating in slow leaky boats near the shoreline where it is relatively safe and assistance remains readily available. It is not a seafaring society because its crude technologies, inadequate resources, and underdeveloped sailing skills make it extremely hazardous to move further out into the vast unknown oceans. Until substantially improving such conditions, land-based social phenomena dominate everyday life. Similarly, space capable societies possess only a rudimentary space exploration capability. Earth-based social phenomena dominate as the

hazards of space travel currently overwhelm our abilities to move very far away from *our* shores (i.e., the Earth) (Pass 2004b:15-16). [See also Gangle (2004)].

Obviously, we have a long way to go before we can develop a spacefaring society. Nevertheless, we should begin to study this potential trend. Throughout the space age, we have incrementally added new elements to our cultures and social structures that characterize enduring astrosocial phenomena. As such, we currently find ourselves on a possible course toward the formation of spacefaring societies around the world.

The course toward a spacefaring society is by no means assured. In fact, it depends upon many factors as I related in Part Two of my *Inaugural Essay*: "...the transformation into a spacefaring society, while certainly possible, remains dependent to a significant extent upon the success of the space sciences to solve Earth-based social problems and inspire the population to support their advancement" (Pass 2004:23). The very possibility of this transformation requires input from social scientists. Based on the foregoing discussion, it is probable that an important specialization within astrosociology will involve the area of futures studies as related to outer space (see Bell 2003a and 2003b for a sociological perspective on futures studies). To realize this theoretical future, space scientists and engineers will need to work closely with applied astrosociologists so that trends in astrosocial change may be recognized and thereby shaped into further progressive astrosocial change that moves societies toward a spacefaring future.

Conclusions: Developing Astrosociology

Space scientists (trained almost exclusively in the natural sciences) require assistance from social scientists (as well as the reverse). Moreover, I believe that the two communities need one another in order to allow humanity to advance its knowledge base to an extent that can allow for travel beyond its own backyard. Each of the two major scientific branches must shed

its historical biases and reasons for mistrust and learn to work with the other (Harrison 1997).

Based on history, this effort will take much effort, and time, to accomplish. It is not inevitable, so scientists from both branches of science must purposely work toward its achievement.

The idea regarding the need for scientists within the natural sciences and those within the social sciences to collaborate is not new.

As [Albert A.] Harrison (1997:323-324) pointed out long ago in the conclusion of his book about SETI, the *thinking types* (from the space sciences) and *feeling types* (from the social sciences and humanities) need one another to maximize the likelihood of a successful outcome. Consistent with this reasoning, the social science and space communities must devise new ways to coordinate their efforts (Pass 2005a:28).

The very same argument regarding SETI may be expanded to all human space activities. As emphasized throughout this discussion, astrosociology was created, in part, to make this reality of collaboration possible. Astrosociology can serve as the means by which the *great divide* separating the social sciences and aerospace may be bridged on a formal and permanent basis.

In short, then, “developing astrosociology for the space sciences” involves the addition of astrosocial knowledge to space-based knowledge to form a more balanced understanding of humanity’s destiny in space. Knowledge relevant to the space sciences and engineering disciplines remain important, of course, but they represent only half of the overall knowledge base (Pass 2006c). Astrosocial knowledge represents the other side of a figurative coin. A great need exists to recognize each side of this figurative coin and bring both sides together to form the total knowledge needed to understand the full range of ramifications involving space and its important connections to terrestrial societies (Pass 2006b). This combination of both space knowledge and astrosocial knowledge possesses the potential to produce synergies of knowledge impossible by either knowledge base alone. Our continuing failure to pursue this avenue of research can only result in long progress, and perhaps avoidable negative circumstances.

A major argument for the development of astrosociology involves the growing import of astrosocial phenomena both off and on the Earth. Whatever the character and rate of humanity's movement into space, this eventuality represents a fundamental set of transformations. Initially, most of humanity will remain on terrestrial soil, so social systems will transform themselves as their growing reliance on astrosocial phenomena necessitates their ongoing integration. Due to these patterns of emigration from the Earth and the related astrosocial change that occurs on the Earth, it is necessary for social scientists (astrosociologists) to study all related features and influences upon social and cultural patterns of development, adding a dimension of knowledge unfamiliar (though highly relevant) to space scientists and engineers.

By collaborating, all major parties benefit including space scientists and engineers, social scientists, formal and casual space enthusiasts, and entire societies. Again, formal collaboration represents a worthy goal because the outcome of this sustained relationship will yield new ideas impossible from either perspective on its own accord. The farther we venture from our "backyard," the more important the contributions of social scientists become. Even on the Earth today, the failure to take advantage of social science concepts, principles, theories, and research findings places humanity at a disadvantage.

I encourage advocates and scientists from all backgrounds to actively think about, and act upon, the implications of astrosocial phenomena. The relationship between space and society, while historically ignored to a great extent, remains a fundamentally important consideration for the future of humanity both on the Earth and among the stars. Support for the development of astrosociology will benefit all interested parties as this field can bring astrosocial phenomena to the forefront. Astrosociology represents the missing component in our ongoing attempt to understand the cosmos and our place in it. The astrosocial knowledge gained will serve to

promote the progress of all of humanity whether particular individuals and groups favor space exploration or not. In my estimation, we cannot afford to follow familiar patterns associated with the status quo. Collaboration is of paramount importance. We must blaze new trails in the sciences as well as in space.

Notes

1. This paper was presented on May 4, 2006 in Los Angeles, CA as part of the “Space Science” session at the *2006 International Space Development Conference (ISDC)* co-hosted by the National Space Society (NSS) and the Planetary Society.

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