

**INTRODUCTION TO ASTROSOCIOLOGY:
AN ASSESSMENT OF ITS DEFINITION, RELEVANCE, and SCOPE**

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Abstract

Astrosociology is a new subfield of sociology and new multidisciplinary field inclusive of the other social sciences, behavioral sciences, and the humanities (hereafter referred to as “the social sciences” for brevity). It was founded by Jim Pass in July 2003 with the uploading of a website called *Astrosociology.com*. Astrosociology now exists to address the long overdue need to create a single body of knowledge and related literature focusing on the relationship between space activities and human societies. This essay demonstrates the need to develop astrosociology for both the social sciences and the natural sciences. A significant theme involves the argument that, as space activities become more advanced, two patterns will grow more complex and influential: (1) the impact of astrosocial phenomena on terrestrial societies and (2) the nature of human missions and expeditions involving the need to ensure the survivability of social environments isolated from the Earth. Both trends require the social science and space communities to bridge the chasm that historically divides them so they may formally collaborate to address these new realities before they emerge to potentially overwhelm the space scientists and engineers who still remain largely unfamiliar with the very topics commonly addressed by social scientists.

**INTRODUCTION: ESTABLISHMENT AND
DEVELOPMENT OF A NEW FIELD**

The main purpose of this paper is to introduce the new field of astrosociology to the European space community, and thereby initiate a discussion with scientists from all regions of the world concerning the common interests and relations between the social sciences and the space sciences. This is a relationship of growing importance in light of plans for new interplanetary human missions and the continuous extension of the limits of scientific knowledge of the nature of outer space and its potential for humanity.

The major topics and arguments advanced here are not new to everyone living beyond U.S. borders, and not totally unknown in Europe (for example, see Ormrod 2005).¹ The residences of James Ormrod and the second author of this essay (Jesper Jørgensen)

are from nations other than the United States, two examples of many international supporters of *Astrosociology.com* and members of the astrosociological community. (The website allowed worldwide access in order to gain knowledge about the field).

Generally, this new field exists for three major reasons: (1) to organize social scientists interested in space research and allow for the formal construction of a new body of astrosociological knowledge and its related literature; (2) to allow for the formal collaboration of these “astrosociologists” with scientists and engineers in the space communities of various countries around the world; and (3) to generate a new perspective of integrated thinking, and related theory and research, of human social interaction and social organization on the micro, middle, and macro planes in space and on Earth as a reflection of knowledge gained from and

exploring space. These three goals indicate the enormous difficulties ahead. At the same time, they provide a glimmering of the great potential of this new field.

Albert Harrison, a preeminent social scientist in the general area proposed as the domain of astrosociology, recognizes the potential of this developing new field.

Recognizing that contemporary human efforts in space are best viewed as the tip of an iceberg and as possible precursors of grander future efforts, astrosociology proposes to move sociology into the space age...Astrosociology deals with the broad, societal contexts of activity pertaining to space, as well as actual space exploration including human space exploration and the search for extraterrestrial life.²

Of note is Harrison's emphasis on the tremendous potential of the human presence in space in the future as a significant element of human progress. Also of note is his recognition of bringing in sociology (and the other social sciences) into the space age at an unprecedented level of organization and influence. Formalization of this process requires development of a new field due to the lack of organization that existed prior to its establishment.

As things stood without the existence of astrosociology, social scientists worked on their research in isolation or with a few others, but the social sciences could not participate in the activities of the space community for the most part. Psychology represents a historical exception to this general rule. From the beginning of the space age, the Soviets integrated psychology into their spaceflight programs, due to both a behaviorist tradition and the idea of social engineering as a tool for creating the new society in the Soviet era.³

Only a few psychologists worked in NASA programs during the space age thus far, as there was a priority of engineering as the solely fundamental background for the space program, and a near total denial of human factor problems, following selection of the first astronauts with the "right stuff." In both the Soviet and American systems, a serious neglect existed of the larger understanding of the impact and interaction between the individual and society that resulted from their space programs, including the space sciences. This neglect, fueled most strongly with the advent of the Cold War, was due to a large influx of military thinking in the space programs for

both superpowers. In contrast, new interplanetary space missions will probably create a shift in paradigms, where the human factor will receive recognition as a fundamental key to success. Moreover, the impact on society of new knowledge (e.g., water on Mars or rudiments of life on Europa) could radically change the understanding of our presence in space and the organization of social life on the Earth.

The following passage summarizes the status of the social sciences along with the promise of astrosociology.

...[sociology and] 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 [alone].⁴

The establishment of astrosociology was long overdue. Its development continues in a slow yet methodical manner. To date, supporters of Astrosociology.com include sociologists and other social scientists as well as space scientists and engineers within the space community.

The greatest challenge to the successful development of this new field involves convincing a large number of social scientists to adopt formally the label of "astrosociologist" in a climate in which the general topic of "outer space" received very little attention throughout the space age. Those who take this step face credibility problems due to the lack of legitimacy attributed to space issues within sociology and the other social sciences.⁵ The following quotation simultaneously expresses the need and difficulty of establishing and then successfully developing a new field bridging social science with aerospace:

When Jim Pass contacted me before the 2004 ASA meeting about starting an astrosociology section within the American Sociological Association, I had two thoughts: 1) It's about time! [and] 2) ...boy,

is he in for some hard knocks!⁶

The first thought motivated the movement to initiate the establishment of astrosociology. The second thought has played out as well though slow and steady progress prevails in the United States and to a lesser extent elsewhere (thus far).

Overall, the importance of the movement to develop astrosociology prevails over the tribulations caused by the resistance among early supporters. Historical inertia caused the social sciences to ignore space research and, apparently, no one dared to challenge the status quo in a big way, until the advent of astrosociology. Author Jim Pass finally did so simply by declaring that: “Astrosociology is a new (1) subfield of sociology and (2) a general field of the social sciences.” This declaration initially resulted in the formation of supporters, critics, but mostly silence. Indifference represents the greatest challenge within the social sciences at this early stage though it cannot continue forever.

Successful development will require that many social scientists take the difficult step of demonstrating the inherent value of astrosociology. Fortunately, this process has already begun in the United States. The introduction of astrosociology here aims to begin the process in a big way beyond its borders by introducing the distinguished IAC membership to its existence, relevance, and scope at this particular conference.

ASTROSOCIOLOGY DEFINED

The definition of astrosociology was difficult to come by largely due to the absence of literature seeking to tie together space with social and cultural issues. As acknowledged above, individuals have conducted notable work in this general area, though very little formal organization existed in the past. There seemed to be no effort to formalize their research into a single field recognizable by others doing similar work or by scientists in the space community. Regarding the latter point, scientists in the natural sciences could not take social scientists as seriously when they worked as individuals outside the boundaries of a legitimate, recognized field. Arguably, it is much easier to gain credibility when one is working in an accepted field. A definition seems warranted at this point. One of the coming challenges of astrosociology will involve integration into the space science and engineering community. This includes gaining respect as an equal discipline and necessary partner to space engineering, astrophysics, life science, and so on.

Astrosociology is the study of astrosocial phenomena (i.e., social and cultural patterns related to outer space)^{7, 8} It was first created to address a combination of Jim Pass’ interest in space with his training as a sociologist, catalyzed when Dr. Pass first saw the suggested term astrosociology in an article by Allen Tough⁹ about the social consequences of SETI research. When Dr. Pass read Dr. Tough’s suggestion that a new field was warranted, it provided the necessary spark to move forward in carrying out his dream to create a single field that combined the social sciences with outer space. Approximately seven months later, on July 15, 2003, he uploaded the initial version of the Astrosociology.com website. This event marked the official establishment of astrosociology.

Astrosociology is a scientific field rather than an advocacy enterprise. Its purpose resides in its study of astrosocial phenomena in whatever form they may take. A slow level of progress in space exploration and space travel is just as worthy of study as accelerated progress. Both scenarios require study and understanding. It is possible for the same person to hold statuses of both a social scientist and advocate, however.

Thus, it is undeniably possible for an astrosociologist to advocate greater space exploration, for example, and still study astrosocial phenomena objectively. As long as advocacy and enthusiasm about a given set of phenomena do not affect the proper conduct of science and research, then no problem exists. This argument may seem obvious, but it is important to emphasize that astrosociology must be a social science and not simply a forum for advocating greater funding for various space or astronomical pursuits and programs.¹⁰

It is much more serious for the advocate’s status to influence the scientist than the other way around. While acting as an astrosociologist, an individual must take extraordinary measures to guarantee his or her objectivity.

Why is it important to establish astrosociology? Astrosociological issues clearly become more important the farther we venture into space. If we break the category of astrosocial phenomena into two types, with the first type influencing humans living on Earth and the second type affecting human social groups existing in space, then it becomes clear that the future of our social existence will become more

complex and less familiar. Thus, a greater need will exist for astrosociological research. The discussion to follow demonstrates the need for the development of astrosociology for a myriad of different reasons that only scratch the surface of its potential.

Applied Astrosociology

As will become more evident by the examples provided later in this discussion, the practical aspects of astrosociology will prove indispensable in allowing humanity to move forward in the exploration of space. Thus far, space science and engineering, with a limited amount of input from the psychological discipline, was adequate to allow progress. This will soon end as the future of space exploration will require insights and research findings that only social scientists can deliver, and it will require it to a much greater extent than NASA, ESA, or any other space agency is currently willing to admit (or perhaps capable of understanding).

Applied astrosociology is defined as: ...the application of astrosociological knowledge to astrosocial phenomena in a manner consistent with improving them for the betterment of (1) space exploration and potentially (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.¹¹

Sociologists especially, but also other social scientists, concern themselves with social problems and their influences on society, including social change. Study of the impact and potential of astrosocial phenomena involve the collection of important information, of course, although the practical application of this knowledge will likely prove to be an even greater contribution of astrosociology. With such data, applied astrosociologists could help manage astrosocial change in ways that benefit society more greatly than would be the case without their participation.

The value of applied astrosociology will become increasingly apparent as discussions involving space societies, spacefaring societies, and planetary defense reveal the need to bring in a category of information currently best characterized as a gap in knowledge because it falls outside the normal boundary of the space community. Sociology and other social science disciplines have accumulated much knowledge about human behavior on the Earth. Much of it is

applicable in space, and even necessary for future space missions, and thus it can fill in the gap with specific knowledge unavailable in the natural science or engineering disciplines. Moreover, new research findings specific to astrosociological research will contribute even more. The greatest benefit of astrosociology would occur from within the space community, including the national space programs of nations throughout the world. Therefore, it is vital that we create an international formal working relationship between astrosociology and the space community.

COLLABORATION WITH THE SPACE COMMUNITY AND THE "GREAT DIVIDE"

With the establishment and subsequent development of astrosociology within sociology and the other social sciences comes the difficulty of establishing a formal collaborative framework with the space community. In part, such a framework would require the space community to acknowledge the need to bring in the social sciences, a reality that has historically met with resistance during the course of the entire space age. Marilyn Dudley-Rowley,¹² an early proponent of astrosociology, brought attention to the historical divide between sociology and aerospace. Expanding her initial definition, the Great Divide describes the rift between the social science and space science communities. It refers to the isolation of the two branches of science: the natural sciences and the social sciences. Typically, space scientists and engineers fill the ranks of national space programs and aerospace companies (beyond the assortment of "practical" organizational statuses such as managers, accountants, and secretaries). The rift and its consequences is a paradox in general science, too, as earlier described by C.P. Snow.¹³ Therefore, the dilemma in space exploration is a manifestation of a general dilemma in western science between what is seen as "real science" and "not so real science"

A dilemma exists in research in human spaceflight where a limited number of possible participants in most studies have a negative influence on the traditional quantitative approach used in natural science. Despite this, quantitative methods represent the most common approach to answer psychological and sociological questions; but they require discussion in relation to validity of the results, as a limited amount of data gives a higher significance to bias of the results. Results from studies based on qualitative methods, now fully accepted in psychology and sociology often receive rejection as anecdotal, as the results are seen as non-scientific by

natural scientists. (See Kanas and Manzey¹⁴ for an example of this). Astrosociologists must therefore take the necessary step to develop new research methods based on the principle to get maximum information from a limited amount of data (that are acceptable to space scientists).

Development of this new field serves a greater purpose than focusing interested social scientists on a single field called “astrosociology.”

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.¹⁵

The addition of the other branch of science to the study and planning of space concerns would truly increase the potential of humankind due to this new balanced understanding of these issues.

Historically, “[t]he social and organizational forces are enormous that keep sociology and the aerospace field apart.”¹⁶ Even so, the introduction of astrosociology has led to developments that make the Great Divide seem like less of an obstacle than before its inception. Collaboration with the aerospace community, though still in its infancy, now exists. For example, while NASA seems to pose a great challenge, individuals within the agency do express support. Moreover, the membership of the American Institute of Aeronautics and Astronautics (AIAA) ironically expresses greater overt support than those of sociological and other social science professional associations. Before long, an astrosociology working group or subcommittee will become a reality. A similar accomplishment within the IAA or another non-American association would represent a formal expansion of astrosociology within the space community beyond the United States.

Thankfully, exceptions within the sociological community exist. The California Sociological Association (CSA) will allow an astrosociology session in 2006 for the third year running and the Pacific Sociological Association (PSA), a larger regional organization, has approved a special astrosociological session for 2007. The national organization, the American Sociological Association (ASA), represents a much more difficult challenge, though these difficulties do not stop efforts to make inroads in the long term. Plans for formal acceptance are currently subject to combination of indifference and resistance that exist,¹⁷ though the efforts move forward. Once again, astrosociologists must make the case within their own disciplines that their new field is required for progress in space exploration and commerce.

This paper seeks to make the case for both the development of astrosociology and its bridging of the great divide between sociology and aerospace in a way that makes possible the creation of a new body of astrosocial knowledge...in which ideas relevant to both space and society come together to forge a new understanding heretofore impossible to synthesize...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.¹⁸

Collaboration will allow for two normally separate branches of science (i.e., the natural and social sciences) to interact which, in turn, will likely result in an immense increase in knowledge. Thus, both branches of sciences will benefit, as will the societies in which they operate.

Astrosociology can serve to bridge the two scientific communities based on their mutual focus on space issues. This important change can easily occur with the advent of greater interest among space scientists in social and cultural issues relevant to their own work. Figure 1 depicts the great historical chasm between the social sciences and the natural sciences that serves to (1) isolate the space community from participation by social scientists at a meaningful level and (2) discourage participation by the wide variety of different types of social scientists on an ongoing basis. Additionally, it portrays astrosociology as a potential uniting force that can bridge the two sides together and allow for a greater level of progress currently impossible. Many in the space community refuse to recognize, or worse, cannot recognize, the



Figure 1 -- Bridging the Great Divide¹⁹

significance of the Great Divide as it relates to the future of humanity's movement into space.

In summary, then, the Great Divide is no longer as "great" as it once was only three years ago. Nevertheless, the greatest challenges continue to exist in the form of establishing (1) a formal collaborative structure between the astrosociological and space communities and thus (2) a viable global astrosociological community. Hard work and patience represent the greatest virtues that will allow for the meeting of these goals, though it also necessitates the continual vociferous efforts related to the definition and justification of this new field.

Education of Astrosociologists

A growing need exists to nurture schoolchildren and older students so they become more likely to pursue the sciences. NASA and other space agencies focus on inspiring students to do so through their utilization of materials and activities related to space exploration. However, they concentrate on coaxing students to become mathematicians, space scientists,

and engineers. Such goals are indeed important and worthy of pursuit. There is no doubt that more students need to go into these disciplines.

However, the need also exists for students more attracted by the social sciences to receive motivation in pursuing their interests by using these same space-related materials and activities to promote astrosociology. Providing the inspiration of prospective social scientists to advance their educational careers requires pursuit for reasons evident throughout this article.

We must open ourselves up to more-inclusive possibilities for the future. Rather than utilizing space exploration to stir the imaginations of only potential space scientists[, mathematicians,] and engineers among our youth, we should also do so to motivate all potential scientists. As an additional step, we must utilize space exploration to encourage potential astrosociologists to follow a different, though related, path. In order to ensure the

greatest, most comprehensive understanding of humanity's destiny in space, we must encourage students in the physical sciences and engineering disciplines, who serve as the usual targets, but also those in the social and behavioral sciences...[as well as] the humanities to become involved in the study of astrosocial phenomena. This implies that government agencies and private organizations should bring the inspirational effects produced by outer space into social science classrooms. It will prove in our best interests to make funding available for astrosociological programs as well as for [the conventional targets of educational improvement].²⁰

Making this a reality will involve a certain amount of restructuring of the educational institutions at the primary and secondary levels, and at the postsecondary levels as well. The development of astrosociological curricula and courses will be required, as will the training of teachers and professors versed in the most important issues relevant to astrosociology. The best approach will involve a slow yet methodical introduction of this new field into educational organizations.

This subject requires the dedication of an entire article (or book for that matter) and thus the provision of more detailed coverage falls outside the purview of this article. Suffice it to state that the expansion of astrosociology in our institutions of education will occur to the extent that the field of astrosociology receives recognition as important for societies around the world. Therefore, it seems likely to occur as the following questions suggest. How well do we really understand the impact of astrosocial phenomena on society (past and present)? How important is it to our future to gain such an understanding? Finally, based on the foregoing questions, how important is it to educate students who indicate an interest in dedicating themselves to pursuing astrosociology? It does not take an astrosociologist to conclude that the future of humans in space, and on the Earth, for that matter, depends on educating students in both the natural and the social sciences. At this point, however, it does not seem as though this viewpoint carries enough weight or even enters seriously into the minds of most people in the space or social science communities. An important goal facing astrosociology involves overcoming mild criticism and especially the indifference that exists.

GLOBAL REACH OF ASTROSOCIOLOGY

As expressed earlier, an important area of organization involves the collaboration between social scientists and space scientists/engineers from North America with their European and global counterparts. The growing importance of ESA and other non-American space agencies, not to mention the private companies around the world increasingly focusing on space, clearly dictates that astrosociology will need to gain global recognition and acceptance. The global character of astrosociology simply mirrors the global effects of astrosocial phenomena.

Many of the issues in need of research involve issues that will require international cooperation (e.g., planetary defense, global social problems, a space-oriented global economy, and cooperation in large projects related to space exploration). Some social and cultural patterns will undoubtedly occur on a global scale requiring collaboration among social scientists around the world. Others undoubtedly involve unique astrosocial phenomena in different societies and thus comparative analysis among them. For example, how different are the issues related in this paper different in countries outside the borders of the United States? Differing cultures will inevitably produce at least slightly different social realities and trends in various nations. We need to understand the differences, of course, but we must also consider the similarities that exist.

One important aspect of astrosociology as a field, one that will ultimately determine its success or failure, concerns its inclusion in curricula in various sociology and social science departments around the world. The education of burgeoning astrosociologists discussed earlier must occur on a global basis. A prior step to formal astrosociological education is taking place now with the introduction and integration of astrosociology in professional conferences in both the social science and space communities. This article serves as the first formal introduction of astrosociology to a non-American audience consisting of space professionals.

RELEVANCE OF ASTROSOCIOLOGY

The relevance of astrosociology permeates throughout this discussion and it will become even more obvious in this section. It is not difficult to demonstrate it. In fact, astrosociology now exists despite a status quo in which the relevance of astrosocial phenomena has shown itself throughout the space age even without the great participation of social scientists inside or outside of the space community. Neither the social science nor the space community acknowledged the need to study

astrosocial phenomena even as these social and cultural forces affected societies (including contributing to social change). Humanity has progressed enough in the nearly fifty years that comprise the space age to demonstrate the need to develop astrosociology. The future will require astrosociology even more significantly.

In general, the relevance of astrosociology relates in large measure to the future direction of humanity. More precisely, it relates to the most probable positive scenario that corresponds with a future characterized by the progress of human societies.

A large measure of astrosociology's relevance lies in the understanding of the changing nature of societies and how part of that change is traceable to astrosocial phenomena. Working in space and exploring its properties remain unarguably expensive. However, the benefits of knowledge, inspiration, and economic returns are difficult to duplicate by other means in the long term. Thus, the possibility of a spacefaring future exemplifies a rational extrapolation of past and current conditions rather than a "far out" dream.²¹

A greater level of relevance depends on continued progress, then.

...astrosociology will become progressively more relevant as we move further into the twenty-first century...Unless humanity is knocked back to the Stone Age by some massively destructive event, or social problems become overwhelmingly disruptive, it is apparent that the relevance of astrosocial phenomena will increase in the future.²²

Progress, in fact, depends on societies seeking new challenges. Space represents an infinitely large ecology essentially, so movement into this "frontier" represents the next logical expansion of human beings from their current societal territories. This is important because history has shown us that the failure to expand by seeking and meeting new challenges has resulted in the downfall of societies.

As already discussed, the space community excluded the social sciences to a very high degree for nearly all of the fifty years that comprise the space age since the launching of the Sputnik space probe. In all of that time, the subjects falling under the purview of

astrosociology were important to human societies and their rapid pace of social change. Indeed, the importance of astrosocial phenomena grew more substantial in proportion to the increase in the rate of general scientific and technical change. While this occurred, research associated with the effects of astrosocial phenomena never materialized to the extent that matched the significant of the subject matter.

The status quo can no longer provide for the advancement of humanity into space. Perhaps the greatest relevance of astrosociology pertains to its dedicated focus on astrosocial phenomena. The intersection of human behavior (and society) with outer space affects us all deeply, but our knowledge about the nature of such effects remains superficial and incomplete. As we send increasingly large populations to increasingly far distances beyond low Earth orbit (LEO), the social sciences will become vastly more critical to the success of both public missions and private ventures.

The relevance of astrosociology is evident in our need to understand the history of the space age beyond the simple technical and scientific achievements. Its impact on societies requires greater study for historical reasons and for the utilization of the knowledge gained for future human activities in space. Relevant areas include technology transfers/spinoffs, social change attributed to astrosocial phenomena (i.e., astrosocial change), construction of space settlements (i.e., space societies), transformation into spacefaring societies, solving social problems, and planetary defense. Each receives attention next. The social sciences will improve our understanding of these astrosocial phenomena and contribute in the form of astrosociology to a much more comprehensive understanding of them. Perhaps more importantly, however, our understanding about how to address them will increase as well. The formal collaboration between astrosociology and the space community cannot receive too much emphasis given our current position and our future advancements in space.

It is in this context important to emphasize that the future is not a line of determined and automatic events to come, but is an interaction between present societies and coming ones. The basis for the future does not hinge on a single line of development but on a multitude of possible futures based on present decisions combined with developing decisions. Astrosociology has a role in emphasizing and studying multiple futures we face, and therefore a role in formulating the important decisions of how we

expand into space as a human race. Formal collaboration with the space community will result in a new emphasis on the relationship between human societies (and their cultures) with humanity's apparent need to explore space that will contribute to progress. In contrast, the historical separation between the two only hinders progress.

Social Change and the Increased Influence of Astrosocial Phenomena

No question exists that the increases in the standard of living of nations around the world, in part, arise from the technology transfers and related spinoffs of NASA, the ESA, and other space agencies. In general, the increased level of the influence of astrosocial phenomena leads to social change and progress. Astrosocial change, specifically, requires focused attention.

If we divide a particular society into two parts, an astrosocial sector and a non-astrosocial sector, then we can imagine the possibility of social change arising from their interactions.

While astrosocial forces contribute more to social change as time passes, a great deal of overall social change for a particular society results from social forces generated by the interactions between the astrosocial and non-astrosocial sectors. An important area of research is related to how much social change results from these interactive effects. In fact, it is important to measure the proportion of social change created by non-astrosocial, astrosocial, and interactive forces at different points in a particular society's history.²³

The possibility of these effects requires investigation though it seems logical on a theoretical basis. This area of research could become an important specialization within the field.

Without the participation of astrosociologists in research related to outer space, which are themselves forms of astrosocial phenomena, the empirical findings produced by space scientists contribute to social change on an ongoing basis.

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.²⁴

The problem that we face as a general scientific community is that these contributions to social change rarely receive attention and thus the understanding that befits their significance.

One area of research that affects societies includes astrobiology and the Search for Extraterrestrial Intelligence (SETI). These two related areas of research conducted by natural scientists affect societies just by publicizing their question about life in the universe and our place in it. Even more remarkable, using SETI as an example, what could a positive outcome signify for human societies?

The possibility of the eventual success of a SETI project provides a very good example of how astrosocial phenomena can affect the non-astrosocial sector! It raises some extremely intriguing questions. What would happen if a SETI project finally did find irrefutable proof of extraterrestrial intelligence? How would non-astrosocial segments of societies around the world evaluate such a discovery? What effects would it have on various specific societies? How would the course of social change be altered by such an event? Consider this: at some distant point in the future, astrosociology may include the study of a known extraterrestrial society and its quantifiable impact on Earth-based societies!²⁵

Human societies would undoubtedly change. "Obvious areas of concern include social change, cultural diffusion, technology and culture, international relations, meta-law, sociology of knowledge, sociology of law, sociology of occupations, social welfare, the history of science and technology, and intergroup relations."²⁶ The social scientific connection is rather obvious though participation by social scientists in these areas remains unlikely on a formal and widespread basis. Astrosociology could change this pattern to something more productive for both communities.

In addition to the Great Divide discussed earlier, astrosociology must attempt to stride over another chasm: the gap between the present and the future. Astrosociology must combine both present natural

and societal science with future studies, defined as the scientific method and theory of predicting or interacting with development paths from where we are now to points into the future. An understanding of the importance of present developments and decisions, and their influence on a spectrum of futures, represents a great challenge. The space sciences do include this as a part of their fundamental approach, due to considerations such as long production cycles of new vessels for space exploration, astronomic distances in space, and time itself as an absurdity in relation to Cosmos.

This subspecialty known as futures studies already seeks to develop a systematic approach to the study of social change. It exists in the field of sociology as well as other social science disciplines. The sociological approach to understanding and intelligently shaping the future (at least potentially) is most familiar to the primary author (Jim Pass).

The newly emerging subfield within sociology known as futures studies seeks to apply the sociological perspective to the scientific study of possible alternative futures. (See Bell (2003a) and Bell (2003b) for an excellent treatise on this new subfield). Utopian models are clearly one type of alternative future, and one which we strive for under the best of circumstances.²⁷

The idea of “alternative futures” implies that the direction and character of social conditions is not necessarily preordained, but new patterns are more likely to develop in certain ways unless someone attempts to channel them in ways those with power consider positive directions. Application of a rigid protocol to study, understand, and influence social change will prove vital as astrosocial phenomena more greatly influence societies in the future.

Democratic governments attempt to shape social change in the forms of policies and legislation. Scientists attempt the same thing by using their knowledge to formulate policy recommendations. Astrosociologists must join them due to the need to better understand the ongoing impact of astrosocial phenomena in the future and make use of this knowledge.

To conclude, social change remains a never-ending phenomenon. The more we can understand it, the better we can use it and even attempt to shape it to our advantage. The influences of astrosocial change, specifically, are largely unknown or perhaps misunderstood as things stand. A greater emphasis

on understanding how astrosocial phenomena produce social change in various societies will put us in a much better position to advance in a more controlled manner that proves beneficial for humanity as a whole. Astrosocial change provides us with another dimension of change with the potential to allow us to move in constructive directions. However, we must heed this call to better understand astrosocial change and thereby place ourselves in the position to take advantage of this underutilized knowledge.

Development of Spacefaring Societies

What follows the post-industrial model of the most developed societies around the world? In other words, when societies move beyond the service and information provision stage, what form will their mode of production take next? Many fear a downturn in the economic power of nations like the United States based on the transfer of current jobs and production to developing nations. This scenario does seem plausible given current patterns within the service and limited industrial sectors of developed nations. On the other hand, space capable societies (i.e., those capable of placing cargo and humans into orbit) possess a capacity to progress in ways developing nations currently cannot match at their current levels of science and technology. The shift to a spacefaring society, or movement toward it, represents a logical possibility.

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.²⁸

A spacefaring society represents something currently only imagined in science fiction, a good example of

which is the worldwide utopian socioeconomic system portrayed in Star Trek, made possible in part by the exploration of outer space and the utilization space resources.

Still, even the most sophisticated space technologies of developed societies represent very primitive levels of progress. We need to understand that humanity's perspective on the history of space exploration and space travel has occurred from its limited view from its own backyard (i.e., the Earth-Moon system). The question arises: Where do we go from here?

...construction of a new model is required to characterize the stages of development along a continuum starting from the simplest societies (Earthcentric forms) to an end point characterized by one or more categories of spacefaring societies (spacecentric forms). Additionally, potential alternative outcomes deserve strong consideration. Such a model could also focus mainly on the dimension of astrosocial phenomena in single society over time in terms of its own changing characteristics in addition to its relationships to other cultural and social structures. This type of exercise not only allows for the determination of astrosocial development in the past and during the present..., but it also permits an extrapolation of changes into the future.²⁹

Development of this new model will allow us to track, in an objective manner, the progress of human societies along the continuum. At our present location on the extreme left of the spacefaring continuum, a position farthest from achievement of a spacefaring society, we have a long way to go. We know where we are today, and we know the basic characteristics of the ideal type of space society (i.e., theoretical model of its most-realized form), so the next step involves constructing the formal model and conducting further research as history unfolds.

Thus, even the most sophisticated national space programs put their nations in a position best characterized as falling on the most primitive end of the spacefaring continuum.

The disconnection between our efforts in space and the awareness of our society lends credence to astrosociologist Jim Pass' (2004) contention, that as we approach the 50th anniversary of human spaceflight, we are still not truly a "spacefaring" culture, but merely a "space-capable" one. The analogy

I draw is of a coastal culture that puts out to sea in small boats and returns with catches of fish, as distinct from a seafaring culture that as a matter of regular commerce voyages between the continents. Likewise, a true breachment of the planetary cradle means voyaging to other planets on a routine basis and establishing permanent, self-supporting settlements on them.³⁰

Development of a spacefaring society requires the difficult implementation of an increase in the scope of astrosocial phenomena characterized as the incorporation of space activities into all institutions of that society, including centering its economy on space commerce and production.

Privatization of space ushers in a new chapter toward reaching the spacefaring goal. When private industry chimes in on its own accord, beyond the familiar model of behemoth aerospace contractors beholden to NASA and other national space agencies for the largest contracts, we can safely state that something new has occurred. When private companies work in space and/or utilize space assets without the assistance of government to make a profit, then a new private space market exists. The privatization and commercialization of space has begun. Placing human beings into orbit represents one of the big challenges. Thus far, in the entire history of the space age, only three nations (i.e., the United States, the Soviet Union/Russia, and China) have achieved this feat, and none of them was a private company of any size.

A very interesting specialty of astrosociology will focus on this spacefaring society topic. We need to examine the social and cultural forces present in contemporary societies that may shape the future of existing social systems, including their astrosocial phenomena. Through the understanding of such forces, it may prove possible to take advantage of astrosocial knowledge, otherwise unknown, in ways that contribute to the progress of societies. If space truly represents the next frontier for humanity, it behooves all of us to understand it more precisely including humanity's place in it. It makes little sense to move forward uninformed when a new field called astrosociology can shed some light on the darkness of space.

Space Societies and Interplanetary Relations

While the bulk of humanity for remains on the Earth's surface for the foreseeable future, the movement of human beings beyond the confines of

its atmosphere will inevitably occur for a variety of reasons. Some of these reasons include solving social problems such as global overpopulation, protecting the continuity of our species should a pandemic occur or cosmic object strike the Earth, and conducting unique pharmaceutical experiments in space for commercial medical applications. Other reasons involve our need to explore unknown and enticing frontiers to satisfy cultural values. Others involve practical motives such as meeting commercial goals. Still others involve finding new places to flee religious or political forms of persecution. Regardless of the reason, or set of reasons, human beings are extremely likely to move into space as technology allows.

If we truly intend to develop a space settlement, we should remember one fundamental rule we often ignore: the construction of the social environment is just as important for survival as the construction of the physical environment.³¹ Moving a population into space requires the construction of a space society (e.g., settlement or colony), including its culture, social groups, subcultures, and institutions. Allowing communities to develop will also prove an important consideration for the survival of the space society.

Although they are unavoidable characteristics, isolation and large population size create challenges that require the creation of social institutions to carry out the life functions that humans living there were socialized to expect, understand, and rely upon in their social environments on Earth. A brief overview of the vital institutions and some of the related issues illustrates the complexities of the task ahead.³²

The institutions we must construct and therefore those that must function to regulate social life successfully in a space society include politics, family structures, an economy, religion, criminal justice system, the military, and recreation.³³

Careful consideration of these types of issues can go a long way toward avoiding the social disorganization and resulting undue conflict characteristic of frontier life on Earth. Thus, the social reproduction of institutions represents a vital exercise. Planners must carefully evaluate and implement social structures that can meet the needs of the colonists and the entire colony.³⁴

Without the purposeful construction of a social system at the outset, the long-term success of a space society becomes less likely, just as if the physical environment failed in some way. The likelihood of chaos and perhaps anarchy would increase. Applied astrosociologists could assist in the planning of the construction of a particular space society by focusing most intently on building its social environment in collaboration with space scientists and engineers.

As human populations move farther into space, old social patterns related to space travel, exploration, and exploitation will inevitably change.

Another problem in astrosociology will be the wrenching change in the culture of Mission Control that deep-space missions will necessitate. For nearly half a century, nearly every minute of every flight has been scripted and directed by Mission Control. Although there has been some loosening up during long-duration, near-Earth orbit missions, sometimes forced by a revolt of the crew, this culture of control remains largely intact and well entrenched. Human spaceflight is expensive, and the culture of control is inevitably driven to squeeze every last drop of value from every minute of human labor in space. The rate of exploitation in space would make even the most venal Earth-bound capitalist blush.³⁵

The greater independence gained by space societies will evolve into relations with Earth that closely emulate international relations among the nations on the Earth.

Based on the history of relations between originating countries and their colonies, the decision of a space society's leaders will most likely follow ethnocentric tendencies. These isolated governments and their publics will begin to consider themselves as separate from terrestrial societies where its members originated over the course of time. At some point, while dependent on many factors, a space society will begin to interact with terrestrial societies as an independent entity, probably as a separate nation. We should begin to think about these future scenarios as serious outcomes in the future and thus determine, probably at the international level, how we will deal with such circumstances. Such considerations will likely lead us to the establishment of protocols dictating how to interact with space societies; that is, the creation of rules and protocols for conducting interplanetary relations.

For the reasons provided here, as well as many more, social scientists need to participate in the planning and implementing of space societies. Additionally, we should include them in the population so that they can study how the space society operates. They could also provide policy recommendations if the need arises. Social problems are inevitable whether a society exists on the Earth or in space beyond our biosphere. Being in a state of preparedness to deal with unforeseen problems can best mitigate their negative effects.

Social and Cultural Aspects of a Planetary Defense System

Experts have confirmed the serious threat of a large comet nucleus or asteroid striking the Earth at some point in the future.³⁶ It is inevitable although these experts cannot predict the exact date or even decade precisely. An important question arises at this point in our history due to the fact that we possess no defense against space objects: How much of a commitment, if any, does humanity want to make toward the construction of a planetary defense system? Moreover, if a commitment is established, what characteristics will such a system possess? The governments, cultures, and publics of different nations will inevitably decide to participate in the construction and operation of such a system based on their willingness and ability to do so among other criteria.

An astrosociological approach would focus on the social and cultural aspects of decisions to implement a planetary defense system as well as a large number of other aspects related to the implementation and operation of such a system. Author Jim Pass³⁷ offers a comprehensive planetary defense strategy consisting of three components: (1) detection, (2) defense, and (3) survival. Astrosociologists would concentrate most strongly on the survival aspects of the strategy because they involve largely uninvestigated social-scientific phenomena although all components do so as well.

The astrosociological approach expands the scope of protection from protecting human lives to a more inclusive, and thus more difficult, standard. The survival component of the strategy requires a new and dedicated focus by social scientists.

Astrosociology emphasizes the need to protect social life as well as human life; that is, existing cultural and social patterns. It points out the need to protect the current standard of living at a level no worse than

before any threat is identified. Adding societal considerations to those emphasized by space scientists and engineers increases our ability to derive a more comprehensive understanding of the pertinent issues.³⁸

The protection of societies, cultures, and characteristic standards of social life demonstrates the contribution of a social scientific perspective. We should strive to save knowledge as well as various elements of material culture such as objects of art, literature, infrastructure, and historical or famous structures.

The planetary defense topic offers a great opportunity for astrosociologists. These types of astrosocial phenomena demand study from a social-scientific perspective. Moreover, social scientists can potentially make unique contributions normally unconsidered by space scientists and engineers yet complementary to their normal areas of research.

Solving Social Problems

Within the discipline of sociology and to some extent other social sciences disciplines, the study of terrestrial social problems embodies an important concern. The study of social problems exists to understand these phenomena, of course. More importantly, it exists in order to determine and implement solutions to these problems. From the unique perspective of an applied astrosociologist, the use of space assets (including knowledge) to solve social problems would seem like a natural approach.

On one level, this already occurs. Spinoffs/technology transfers from NASA and the aerospace industry tend most strongly to solve problems related to problems of industry rather than to the larger social problems plaguing human societies and even humanity on a global scale. To be fair, improvements in medical, weather, and search and rescue applications do address larger humanitarian concerns. However, something is missing. The traditional exclusion of social scientists (and now astrosociologists) from the process of applying technology transfers and their related spinoffs to solve social problems places limits its potential effectiveness.

Finally, our better understanding of social change in various societies, and more specifically astrosocial change, can increase our abilities to find and apply solutions to our seemingly intractable 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.³⁹

A formal approach to studying and benefiting from astrosocial phenomena makes a lot of sense.

The participation of applied astrosociologists in this area would inevitably increase our existing knowledge base isolated in the space community by opening it up to the vast theory and research produced within the social scientific disciplines over the last few hundreds of years. It will add ideas common in the social sciences but rarely addressed in the natural sciences. The synergy of the two camps, the astrosociological and the space communities, should provide at least the possibility of deriving solutions to social problems heretofore impossible. The new formal combination of the natural sciences and the social sciences would cause us to ask new questions, and thus derive new answers, that neither branch of science would consider if focusing exclusively on its traditional scientific agenda.

SCOPE OF ASTROSOCIOLOGY

The relevant areas discussed that indicate future contributions of astrosociology already hint at its extensive scope. The intersection of space and society creates a large scope, and therefore a large number of specialties for astrosociologist to pursue. We have only begun.

One of the important aspects of astrosociology involves the large number of topics that fall within its purview. There are many areas of study that link space and society together in various ways, but they tend to exist independently without much interaction among their scientists. Astrosociology, on the other hand, seeks to bind these disciplines and fields together, along with their scientists, in order to develop a single body of knowledge and related literature.⁴⁰ The development of a collaborative effort, described earlier, will serve to bring traditionally separated individuals together in ways previously unknown (or at least rare).

The scope of astrosociology is expansive as depicted

below, and thus it far exceeds even the diverse topics discussed in this paper. Many see no need to develop a single field that covers all of these topics. However, there definitely exist significant reasons to pursue such an overall development within the social sciences and in concert with the space community.

The common factor tying all of these substantive areas together boils down to astrosocial phenomena. Astrosociology can serve to tie together currently disparate disciplinary subfield related to space [and society] as evident by some of its proposed specialties:

- 1) new focus on astrosocial phenomena;
- 2) astrosocial change;
- 3) astrosocial education and advocacy;
- 4) social impact of astrosocial phenomena;
- 5) cooperation and conflict in space;
- 6) culture, including support for space exploration, Earthcentric vs. spacecentric distinctions, and other implications;
- 7) futures studies related to outer space;
- 8) history of astrosocial phenomena (even preceding the "space age");
- 9) human isolation issues;
- 10) material culture related to space infrastructure;
- 11) military issues in space;
- 12) private vs. public astrosocial phenomena;
- 13) privatization of space;
- 14) influences of science fiction;
- 15) space law and space policy;
- 16) space migration and space societies (colonies/settlements);
- 17) space tourism;
- 18) influences of space sciences on society (including solving social problems);
- 19) influences of space sciences on society;
- 20) social aspects of space medicine;...21) space-capable society vs. spacefaring society [;and 22) social and cultural ramifications of planetary defense strategies].⁴¹

Most of these specialty areas exist within multiple disciplines...[simultaneously]. Regrettably, they [continue to] remain isolated from one another to a great extent. Astrosociology promises to unite them into a single field that is easily identifiable, facilitating greater interdisciplinary collaboration.⁴²

The unification of all issues related to astrosocial phenomena into a single multidisciplinary field will require tremendous change in how the social sciences are currently structured.

However, in order to move forward in a more productive manner, this change will prove necessary because it will ultimately bind them together in a unique and productive way. Social scientists working in a variety of substantive areas related to space should consider becoming astrosociologists so they can collaborate with one another more freely and contribute to the same body of knowledge and literature; and so their greater level of organization can increase the impact of their voice among scientists and engineers within the space community. Regarding the former benefit, a greater voice among social scientists would help to legitimize astrosociology within the various social science disciplines and acquire greater resources for their pursuit of understanding astrosocial phenomena.

CONCLUSION: A FINAL ASSESSMENT

Admittedly, the greatest volume of this article summarizes the work of the founder of astrosociology and principal author (i.e., Jim Pass) and thus it represents a survey of the current state of astrosociology. This approach serves the European space community well, however, because it brings together into one place the extraneous issues related to astrosociology for the simpler consumption of IAC members. This approach relates to a realistic matter as well. As the founder of this new field, Dr. Pass has written and presented to conferences the greatest amount of material associated with astrosociology. The plan is to end this state of affairs by inviting others to participate, though that requires the acceptance of this new field by others before they consider participation in its development. It is hoped that this survey provides inspiration to a significant number of its readers so that a truly international astrosociological community emerges consisting of members from diverse backgrounds and interests.

Astrosociology is a scientific field. It is not a space advocacy group or movement although advocates are certainly welcome as long as they conduct science while filling their roles in the status of astrosociologist. As scientists, astrosociologists do not attempt to shape the future of space exploration or astrosocial phenomena generally. The study of setbacks or periods of stagnation are just as important to understand as growth spurts. Their purpose, like that of any scientist, remains focused on pursuing the scientific method as it pertains to human behavior related to space: to formulate theories and test them through observation, and use the new data to refine or refute those theories, and on and on. With the application of such rigor to the study of astrosocial

phenomena, the social sciences will begin to construct a coherent body of knowledge and its related literature so that humanity can better assess the space age in the past and present tenses as well as contribute to the planning and shaping of it into the future. Applied astrosociologists will offer many insights and research findings unavailable to natural scientists such as astronomers or planetary scientists, or engineers. Serious collaboration in the future requires permanent bridging of the great divide between the natural and social sciences.

In many ways, the most important purpose of this article involves the introduction of astrosociology to a largely European audience with little knowledge of its existence. The several reasons offered here why astrosociology will become more relevant and crucial to the everyday functioning of societies as we move forward into the twenty-first century. While the space community has fared well without the substantial input of social scientists, the same will not prove possible in the future. For example, astrosociology will become more relevant as (1) astrosocial phenomena affect terrestrial societies on a greater basis; (2) space assets become recognized as a means for solving social problems; (3) space societies become serious projects of governments, corporations, and other social groups; (4) terrestrial societies move toward a new level of organization termed here as spacefaring societies; (5) humanity dedicates itself toward construction of a global planetary defense system against asteroids and comets; and (6) the eventual need arises to interact with space societies as separate entities through the establishment of interplanetary relations (not to mention following a successful SETI contact). These areas of focus and research, along with the others listed earlier, point to the need finally to develop a new field such as astrosociology in order to unite isolated scientists and demonstrate the significance of astrosocial phenomena as a common area of inquiry.

Thus, these reasons alone should alert everyone that a great need will develop to train and involve astrosociologists in the understanding and planning of space issues. In any of these scenarios, and especially when considering them all together, the need to study the relationship between space and society (i.e., astrosocial phenomena) will increase in relevance and move toward greater urgency as time advances. The contributions of applied astrosociologists will bring in social and cultural issues to supplement issues historically of greatest concern to space scientists and engineers. Such a formalized collaboration will reap benefits that include the increased likelihood of mission successes

and even innovative directions of research and practice beyond the scope of the traditional space community alone.

Participants in the early development of astrosociology will overtly pursue their interests in an academic and professional atmosphere that may cause damage to their careers, however.

Taking the first groundbreaking steps reflects a most difficult commitment due to the absence of a...academic safety net. The first astrosociological pioneers must lay down the foundation for a well-respected subfield so that others can follow at some future point without reservation related to harming their careers or fearing that astrosociology will never achieve acceptance in the sociological community. They will be the ones who receive the greatest criticism based on their overt attempts to demonstrate the long-denied legitimacy of astrosocial phenomena.⁴³

In the beginning, many sociologists and other social scientists will require convincing before they contemplate risking their careers.

While the possible harm to an individual's career may be great, the potential benefit for the social sciences and the space community is even greater.

Sociology [and all the social sciences] must adapt and renew itself in order to keep pace with this constant change. Since the establishment of the space age, ...[they] most characteristically ignored social patterns related to space. With its focus precisely on astrosocial phenomena, astrosociology provides an obvious opportunity for the discipline to correct its longstanding error. The relevance of astrosociology is rooted in both the significance of astrosocial phenomena and the ...need [for each discipline] to remedy...[its] attention deficit. [Social scientists]...pursuing this new...[field] will pioneer new work in a wide-open, long-neglected dimension of social life. As a result, heretofore untapped groundbreaking and exciting results will emerge simply due to the foray into unexplored areas of...[social scientific] inquiry.⁴⁴

Never before have sociologists and other social scientists organized themselves to pursue the study of

astrosocial phenomena as a single community in the United States. On an international scope, the benefit derived from the collaboration among so many brilliant minds in a single field is incalculable. Furthermore, for the reasons presented here, the benefit to the space community is great as well because social scientists will pursue the very areas of research that fill the gaps needed for natural scientists and engineers to advance their own agendas. These agendas will unquestionably increase in complexity as social scientific (i.e., astrosociological) issues become increasingly relevant to their work and the success of future missions.

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