



Astrosociology Education and the Future of Space Exploration, Exploitation, and Settlement

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The absence of a social science oriented outer space curriculum continues to hinder advancements in current space exploration, exploitation, and settlement activities; those in the planning stages; and future endeavors only dreamed about or not yet contemplated. The missing focus remains on the *human dimension of outer space*. This concept includes the effects of space on human societies, their social structures and cultures, and the behavior of individuals. Despite all of the good knowledge produced by the hard sciences, technological advancements, engineering constructs, and mathematical insights (STEM), both religion and the STEM disciplines have been unable to explain the complexities brought to bear by human beings, both on Earth and in space. Sociology, psychology, and all of the other social/behavioral sciences and humanities were created to fill the gap by inventing another branch of science that focused on this human dimension. In the space community, the “other” branch of science has received only limited attention despite the fact that human beings are the species that happens to explore space. A much greater focus is needed on the human dimension, as it provides the balance to the STEM disciplines. Astrosociology exists to provide this balance, and thus astrosociology education and research must become more mainstream and supported by the space community, both in the context of venturing out into space and coping with the growing impact of space on terrestrial societies. Two older surveys administered by this author are presented to provide some thoughts by students, professionals, and laypersons about the importance of developing astrosociology.

I. Introduction

ASTROSOCIOLOGY, conceived as an academic field by this author in 2003 and officially announced on the internet in 2004, focuses on the human dimension of spaceflight and exploration, areas that have received too little attention historically by mainstream social scientists and humanists. As the study of *astrosocial phenomena* (i.e., social, cultural, and behavioral patterns related to outer space), it fills a void that has existed since the advent of the space age. Historical and psychological issues have received the most attention, though disciplines such as sociology and anthropology have largely ignored space-related issues even though calls for greater attention and participation have existed since the second half of the twentieth century (Bluth 1983; Harrison and Connors 1984; Bainbridge, 1991; Harrison, Clearwater, and Akins 1985; Rudoff 1996; Tough 1998; Harrison, Clearwater, and McKay 1991). This has been changing quite recently, however, and the founding of astrosociology in 2004 by this author has helped in this effort. Yet, while astrosociology education is vital for the future as is proposed in this paper, and notably to better understand the past and present as well, it clearly lacks the inclusion in academia that it so obviously deserves, and this is the central argument presented here.

Why is astrosociology education important and what needs to be accomplished to bring it to its proper level of academic attention? Why is the astrosociological frontier so unexplored? Why are such important astrosocial forces ignored by so many? Why is the human condition of space exploration such a low priority? These types of questions require answers, and more importantly, countermeasures to move human space exploration forward toward its most positive potential.

Celestial bodies and frankly the very existence of outer space have always fascinated human beings who quickly formulated an appreciation for the beauty and wonder of what it all meant. The irony is that social scientists have generally failed to recognize the implications of the impact of outer space on humans and their societies. And moreover, they have failed to recognize how such impacts are relevant to their own disciplines. The fact that nothing

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much in an organized manner has taken place since the founding of astrosociology by this author means that social science based education remains uncommon even today; a reality that needs to change for the sake of improving the likelihood of success of space missions in the future, especially those that venture beyond the cislunar system.

The focus on astrosociology education represents an ongoing effort to (1) demonstrate to both the social science and traditional space communities (consisting almost exclusively of STEM-related individuals in the fields and disciplines related to the physical and natural sciences, technology, engineering, and mathematics) and (2) create an astrosociology community made up of social scientists, humanists, and artists that collaborate strongly with members of the traditional space community. Unprecedented convergence is required if humanity intends to send human beings into other space locales, especially for long duration or permanent missions (Pass and Harrison 2016). Sending humans into space on such missions will require the application of social-scientific knowledge, which is extremely valuable on Earth to better understand human behavior and societies. Because it is logical to project that the social sciences will prove equally valuable elsewhere in the solar system and beyond, astrosociology education is necessary *now* in order to prepare future astrosociologists who will help make space exploration much more successful through the incorporation of astrosocial knowledge into the evolving STEM-related knowledge base. The social sciences and humanities cannot afford to remain silent, and the traditional space community cannot afford to allow them to remain so.

This essay explores both the perceived need for astrosociology education by students and others as well as logical arguments as to why it is absolutely necessary. The fact that a social-scientific/humanist fields devoted to space-based theory and research remains ostracized from academia frankly disappoints and frightens this author. A question arises when thinking about this quandary. How can the future of human spaceflight and exploration continue to be successful without taking advantage of all sources of informed input? With their undeniable positive impact on better understanding terrestrial human behavior and macro-level phenomena, it seems clear that the same application of social-scientific and humanist insight would provide greater chances of success in extraterrestrial locales as well. Humans are complex creatures with actions that both promote and destroy what is best about our species. STEM-based knowledge is necessary for successful space exploration, settlement, and resource exploitation, but it is not sufficient to address social problems and unexpected outcomes that will inevitably arise. Pursuing STEM fields to the exclusion of others is shortsighted because, without involving the social sciences and humanities, this course of inaction will fail to meet future needs in the long run (Pass 2007b). Thus, it is important to pay greater attention to the human dimension of space.

Only a combination of two, a new type of convergence between the two branches of science, can address the entire scope of issues. Thus, astrosociology education represents the missing element that needs establishment in academia. The missing focus on the human dimension of outer space – currently best exemplified by astrosociology – which can only be addressed through education, must be recognized by academicians and thereafter put into action through the incorporation of astrosociological content into existing courses and eventually leading to the creation of astrosociology programs and departments. This idea that was brilliantly demonstrated by Harrison (2001) who was the first Astrosociology Research Institute’s (ARI’s) Advisor and longest standing supporter until his untimely death in 2015. (See Pass 2016b for a discussion regarding his legacy as a pioneering social scientist in the space community and most appreciatively as a devoted supporter of astrosociology).

II. Benefits of Space Education

Astrosocial forces are omnipresent and only becoming more influential. As examples, searching for extraterrestrial life via SETI and astrobiological research and for potentially harmful asteroids can create tremendous social and cultural change should they prove successful (Harrison 2011). Each one can elicit both climates of social cohesion and also extreme fear in a population or social group. The results of these types of space-related events can easily result in violence for varying reasons. On the other hand, even the threat of an asteroid heading for Earth can result in a positive reaction if asteroid defense measures prove successful and the threat is eliminated. If unsuccessful, however, social scientists can assist with how best to implement emergency services based on decades of research that already exists.

In more normal times, however, the benefits of space exploration far outweigh the costs in the form of the amount of resources expended on programs and missions. Technology transfers and spinoffs, while not the reason for supporting space exploration directly, have positive impacts on society, and these types of benefits fall under the realm of the social sciences and humanities as much as they do the “hard” sciences. Therefore, “space education” as a comprehensive concept *should* involve those in both branches of science as well as greater formal collaboration. However, the history of space education is exemplified by the Great Divide because the study of space-related issues has not existed much at all in social science and humanities classrooms and thus has forestalled progress toward

preparing social scientists and humanists for astrosociological careers in which they could teach students to follow their footsteps. This reality presents a negative scenario for society, and this situation should alert all those interested in space exploration.

A. The Great Divide

Science exists to understand nature, both inanimate and animate; that is, in this case, both nonhuman and human. In general, however, the history of space exploration has been focused on nonhuman topics most recently characterized by a concentrated campaign to bolster recruitment in the STEM subjects (i.e., again, the sciences – but not the social sciences, technology, engineering, and mathematics). In a myriad of ways, the social sciences are intertwined into all of these hard STEM subjects because human beings are involved in both carrying out the education and research and also subject to the effects of their actions (e.g., climate change) and their inactions (e.g., volcanic eruptions, hurricanes, and earthquakes). Yet, while historians, social psychologists, psychologists, space policy scholars, and space attorneys have made some important though limited inroads into the study of astrosocial phenomena, space exploration carried on while the involvement of social scientists and humanists such as sociologists, anthropologists, political scientists, and economists has remained quite limited overall.

Traditionally, then, the two branches of science have remained largely isolated from one another, more specifically between sociology (and the other social sciences and humanities) and aerospace (or the STEM subjects), which characterizes the Great Divide (Dudley-Rowley 2004). Unfortunately, it is still relevant. The general status quo remains the STEM disciplines versus the social sciences and humanities, the latter of which provide relatively little input into space exploration research and decision making. (Recently, the arts were added to STEM to create the acronym STEAM, but the social sciences remain missing (Pass and Harrison 2016)). Again, the problem with the current situation is the undeniable reality that while the traditional fields and disciplines are necessary for successful human space exploration, they are not sufficient without the social sciences and humanities making significant contributions. Moreover, it is important to emphasize that the social sciences and humanities need to focus on astrosocial phenomena that occur in and among terrestrial societies. Perhaps the most ironic fact regarding the two branches of science is that their isolation from one another belies the reality that they are complementary and not antagonistic in any way (Pass 2016a).

Astrosociology exists not only to foster communication among the social sciences and humanities regarding astrosocial phenomena, but also to bridge the Great Divide as illustrated in Figure 1 below. This field encourages interdisciplinary interactions so more students, not fewer, are exposed to space-based education overall. This results



Figure 1. Bridging of the Great Divide

in a greater number of STEM students being exposed to the human dimension of space exploration and more social science and humanities student becoming exposed to the more traditional space sciences, technological topics, and engineering issues. Bridging the Great Divide changes the status quo so that convergences occur among all the fields and disciplines that would, as a result, more than likely produce new levels of understanding and insights impossible to achieve within any one narrowed perspective exemplified by a single discipline or even branch of science (Pass and Harrison 2016). Achieving such an objective is not a simple task and it will require the continued development

of astrosociology, which includes alerting a growing number of students and professionals in the social sciences and humanities about its existence and significance to the future of space exploration. Moreover, it will hinge on a growing number of “hard” scientists to accept astrosociology and work to incorporate it into their curricula.

III. The *Astrosociology in the Classroom* Program

Any space-related issue is most valuable when an issue is understood from a variety of angles or perspectives. When the social sciences and humanities provide too little input, then risks increase and long-term space projects are much less likely to succeed, including implementing any settlement objectives or seeking economic expansion into the solar system. It is not too late, but it is important to educate students to become astrosociologists as soon as possible. It is untenable to continue relying solely on STEM-based activities that involve humans, especially as new plans involve increasingly grandiose expectations. Again, the creation of the STEAM movement, which includes the arts (that have always been part of astrosociology), moves in the right direction, but it fails to include the social sciences and humanities. This is inadequate because the study of human dimension is not fully involved.

The *Astrosociology in the Classroom* (AIC) program was officially initiated by the Astrosociology Research Institute (ARI) when this author put together the agenda for the Second Astrosociology Symposium (ARI 2010) that was part of the SPESIF (Space, Propulsion, & Energy Sciences International Forum). The officially named program, as AIC, was probably officially announced to the broader astrosociology community approximately three years later in the official ARI newsletter (Pass 2013). This program serves the purpose of trying to remedy the lack of adequate involvement in the study of outer space issues from an overarching social scientific and humanistic perspective on the one hand, and attempting to increase the interest of the physical and natural sciences in astrosociological issues on the other. The latter objective results in collaborative efforts to bridge the two branches of science together so that the human dimension – based on research by social scientists and humanists – becomes an organic part of the overall approach so that a true convergence exists.

Partly based on the historical absence of the social sciences and humanities in the study of space issues, it has been difficult to initiate a social scientific academic field that focuses on the human dimension of space (Pass 2009). Although the progress is indeed quite remarkable, moving astrosociology from the realm of conference papers and publications into the classroom represents an altogether different challenge.

IV. Respondents Views about Astrosociology

As a rule, the social sciences and humanities have failed to address issues regarding the impact of outer space on society as a mainstream offering to students at the undergraduate level. This is more due to the lack of offerings in departments and programs rather than a diminished interest in space exploration. In fact, it appears that students and adults alike are interested in astrosocial phenomena once they are exposed to them or often even asked about them without an increase in understanding what they entail.

Two unscientific surveys were conducted by this author to gauge the interest (1) among a captured group from three sociology classes and (2) a collection of individuals on Facebook who already expressed an interest in the idea of astrosociology as an academic field. The results of these efforts are presented here with the former referenced in a past paper and the latter data available at the end of this paper. Although these results are not new, they do demonstrate an interest in astrosociology at earlier times when the field was even less well developed than today. They are relevant because of the insights provided even though they do not provide proof of an acceptance of the field one way or the other among members of the student population or public at large. They are encouraging, however, and this line of research requires follow-up.

A. Respondents from Three *Introduction to Sociology* Classes

The student responses collected in three of this author’s sociology classes as an optional extra credit question on their final exam indicate that sociology students as well as other social science and humanities students recognize the value of astrosociology education despite – or perhaps due to – its absence in academia. Even more heartening is the fact that most students in these classes took the *Introduction to Sociology* courses as an elective and therefore they majored in other subjects that were not necessarily within the categories of the social sciences or humanities. Moreover, many of these students did not declare a major at the time they took these final exams. The extra credit item was on the final exam given to students in three *Introduction to Sociology* classes in 2007.²

² The question on the three final exams read as follows: “(2) Would you be interested in a course called Introduction to Astrosociology? This course would focus on issues associated with the relationship between space exploration and society, including the influences of space activities on social/cultural change and the future development of

These data were collated and separated by this author into three categories.

The results shown in [Table 1] indicate a strong interest in astrosociology among an admittedly very small population (and thus sample) of general education college students. It is significant that these students were members of an Introduction to Sociology course rather than one that focused on space or technology in some way. This fact makes their interest in the “sociology of space exploration” all the more powerful as most of them were taking sociology to fill their general education requirements. Informally, most indicated to the author that they did not intend to pursue sociology (Pass 2007a).

While all of the responses are not replicated here, they are available in the Virtual Library at Astrosociology.org for the reader to access at no charge (see Pass 2007a). For the purposes of this essay, three representative responses are provided for the “Interested in Astrosociology” category, which accounted for eighty percent of the responses. To review the twenty percent claiming no interest in astrosociology and mixed feelings about it, see Pass 2007a.

Table 1. Response Frequencies to Final Exam Extra-Credit Item

Semester	Interested in Astrosociology	Not interested in Astrosociology	Not interested in Astrosociology, But...	Totals
Spring 2005	13 (29%)	00 (0%)	04 (09%)	17 (38%)
Fall 2005	07 (16%)	02 (04%)	02 (04%)	11 (24%)
Spring 2006	16 (36%)	01 (02%)	00 (0%)	17 (38%)
Totals	36 (80%)	03 (07%)	06 (13%)	45 (100%)

Note: the percentages in each cell represent the proportion of students in relation to the total population size (n=45).

Below are three responses in the “Interested in Astrosociology” category.

I would be interested in Astrosociology because in the future as space exploration becomes more common and as space programs become more advanced, we will need to know its influences on society. We will need to know how the world will react to new discoveries in space like maybe new habitable planets or even new forms of life. The world is moving towards space exploration and the impact of it on the world can be studied by astrosociology. In the future, astrosociology will be more and more popular as it becomes evident that space exploration has a great impact on societies on Earth and can cause great social change.

The opportunity to take an introductory class to astrosociology would be very ideal for me. As we grow in a technological world of advancement, especially in the United States, where we have achieved such greatness and accomplishments in the study of space exploration, the study of the solar system, the study of possible life outside our own world, and I hope of building communities on other planets, it is all wonderful and fascinating. The study of astrosociology would give us the knowledge and advanced opportunities to explore possible communities and resources outside our own planet. As it is, the world is experiencing overpopulation, as medical technology improves and life expectancy increases. Sociology is a wonderful and interesting subject that helps us to understand life and the interactions, functions and conflicts between/of people. By developing astrosociology as a subject that is just as credible, testable and available, we advance to another step to improving our lives on Earth and to understand life on an even “bigger picture.” There are so many factors that we can learn about; factors out in space that can affect

human societies on Earth and eventually in space itself. Please explain the reasons for your interest or lack of interest in astrosociology” (Pass 2007a:10). This extra-credit item was one of two options available on the exam. The other item covered a traditional sociological topic regarding the state of public education, which had nothing to do with astrosociology.

life on Earth possibly in the near future. By learning about as much as we can about space exploration and society, we can better prepare ourselves for our future and future generations.

I personally would be interested in such a course simply because I have always been fascinated with space exploration and because I think there is a strong influence of space exploration on society. Take for example every space launch. It is covered by the media extensively and we are always interested in understanding our surroundings. It is also interesting to see the social consequences of successes or failures in space programs. I think many people dismiss the idea of space exploration and its influence on social/cultural change. However, if you really pay attention to how society reacts at everything NASA does, you begin to realize there is a definite connection.

These results provide surprisingly sophisticated insights and counter the myth held by many that social science and humanity students are not interested in the study of astrosocial phenomena. In reality, what is most probably the case, is that students are not given the opportunity to study them. There is no obvious route toward becoming an astrosociologist because the astrosociological frontier remains quite barren. These students do show an interest in astrosociology and therefore an interest in space exploration in general.

It can be surmised that space issues likely interest the average student, though some caveats do exist in the research. It was surprising to this author that eighty percent of those responding to extra-credit item on their final exam showed an interest in taking an astrosociology class. While this was not a scientific sample, other studies have found similar results.

For example, Cook et al. (2011) found that students with a higher level of scientific literacy generally had a correspondingly higher level of support for U.S. space exploration, including among political science students. This finding, if generalizable, provides support for the idea that STEM education benefits social science and humanities students in terms of increasing their support for space exploration. It is less clear if the reverse is true, but it can be argued that adding astrosociological content to STEM courses may in fact produce a better appreciation for the human dimension of space exploration. Thus, interdisciplinary efforts between the two branches of science can potentially enhance the support of students from both sides of the Great Divide. There is evidence for such a potential outcome in the literature and research conducted by this author that is discussed later in this paper. While those already oriented toward STEM topics and potential careers are more likely to support space exploration, it is arguable that social science students are also intrigued by space-related issues, hardware, and experiments. Adapting general middle school and high school education to include space curricula increases interest in space and is vital for the future of space exploration (for example, see Ivey et al. 2015).

B. Facebook Respondents

Back in 2011, this author first started using Facebook and created the Astrosociology Research Institute page and soon after created a discussion based on the following question: “**Why do YOU support astrosociology?**” The first post by was made by this author to get the discussion going:

“Please tell us why you joined this group. What is your occupation and how is a social-scientific perspective on space exploration and settlement to it? If you feel that it is not representative of your occupation, why do you support astrosociology anyway?”

The complete twenty-five responses are in Appendix A and available for the first time at the end of this paper. I copied the results in 2011, but I did not act upon it at the time due to recovery issues a few months later. Six years later, it is important to share these results because they address a very important finding: these individuals decided to follow the Astrosociology Research Institute on Facebook and because they recognized the need to study astrosocial phenomena at a time when no academic resource was available to them or others with whom they could collaborate, demonstrating support even if they were not social scientists or humanists. The recognition that astrosociology is a field that needs to be part of the modern educational system exists not only among these respondents, but this author hypothesizes among a substantial number of others as well. While late in sharing these remarks, these data are invaluable and deserve exposure to the space community and especially the social science community.

Astrosociology education still does not exist beyond what ARI can provide. It needs to expand beyond this limited existence so that students may study it; and so that social scientists and humanists, as well as artists, can shift their emphasis to study astrosocial phenomena and educate others about these issues. Moreover, it is important for physical and natural space scientists and engineers to collaborate with astrosociologists as their number increase in the coming years.

This makes it all the more heartening that these respondents recognize that astrosocial phenomena affect humanity in space, of course, but also on Earth. These responses demonstrate much thoughtfulness as to how space exploration and settlement will affect humanity. Additionally, the interactions between those in space and those remaining on Earth (i.e., interplanetary relations) were also addressed, which is a surprising though welcome result. These responses are quite insightful and the reader, especially one not very familiar with astrosociology, would benefit by reading them.

Space departments and programs such as the University of North Dakota and the International Space University already present students with astrosociological topics and issues, and they are aware of astrosociology and ARI's efforts. A great amount of confidence exists that the future will see astrosociology increase its foothold on the astrosociological frontier. However, it will take much effort among a growing number of astrosociologists.

V. The Way Forward on the Astrosociological Frontier

To summarize, the concept of the *astrosociological frontier* continues to serve as an analogy for the current academic landscape that features the dearth of space-based education in the social sciences and humanities. Metaphorically, it refers to the academic wasteland characterized by the study of astrosocial phenomena that has received little attention and thus remains largely unexplored (Pass 2009). Currently, no formal astrosociology academic courses or programs exist, as noted earlier even while NASA and other space agencies along with a growing number of private space corporations continue to voice their intentions to send hundreds and even thousands of humans to the Moon, Mars, and potentially elsewhere in the solar system. In fact, serious research is also expanding toward making interstellar spaceflight a reality.

Despite all of these trends to “conquer” outer space, which involve humans on Earth as well as those beyond its atmosphere who work to make progress possible, the social sciences and humanities continually fail to address this undeniable reality: very little social science education and research focuses on astrosocial phenomena compared to what is needed to face the challenges already created to allow space exploration, settlement, and economic exploitation activities to reach their full potentials. The astrosociological frontier remains largely unexplored, which is a condition that can only spell disaster as things currently stand.

Nevertheless, the development of astrosociology is slowly opening up this frontier resulting in the growing recognition of its existence. This is an important trend, as it results in more individuals becoming involved and acting to settle the astrosociological frontier. There is much catching up to do, as reflected by the large number of astrosociology subfields that require attention as the astrosociological frontier is populated with a growing number of pioneers in this developing field. It is certainly encouraging that a growing number of students are interested in studying astrosocial phenomena and increasingly viewing the human dimension of space exploration as important.

A. Astrosociology Subfields

As an academic field that covers astrosocial phenomena, which comprises several many specific topics, it is important to view astrosociology as a multidisciplinary approach that includes familiar and newer topics. One of the important objectives of this approach is to create a single community in which the social sciences, humanities, and the arts come together to conduct research and provide education in an interdisciplinary manner. Moreover, collaboration with the STEM disciplines is also vital, as “collaborative astrosociology” is in effect a form of applied astrosociology that seeks to shape the overall field. The end goal is to create an educational and research climate in which all relevant scientists and scholars contribute to a truly holistic understanding of humankind's relationship and future with outer space. Convergences among fields and disciplines focusing of space issues that involve the human dimension can only more fundamentally deepen and expand the knowledge base and allow humankind to better take advantage of astrosocial phenomena (Pass and Harrison 2016), which inevitably includes maximized outcomes in space missions and more expanded, even permanent, ventures.

Table 2. A Sample of Astrosociology Subfields

<u><i>Astrosociology Subfield</i></u>	<u>Description</u>
<i>Applied astrosociology</i>	Use of astrosociological knowledge to enhance planning of space missions and projects in conjunction with traditional members of the space community (i.e., those working in STEM disciplines and fields) – primarily applicable to spaceflight, space settlement, and resource exploitation. (See also, <i>social problems research</i> below).

Table 2. A Sample of Astrosociology Subfields (continued)

<u>Astrosociology Subfield</u>	<u>Description</u>
<i>Astrobiology/SETI</i>	Study of the relationship between human and extraterrestrial life; including a focus on (1) the varying reactions to the discovery of an unrelated genesis of life and (2) the positive implications for conducting the search itself.
<i>Collaborative astrosociology</i>	Beyond creating formal interactions among the social sciences, humanities, and the arts, a concerted effort is made by collaborative astrosociologists to expand collaboration with those in physical and natural sciences as well as the STEM fields and disciplines in the effort to develop holistic and synergistic outcomes.
<i>Deviance and astrosociology</i>	Study of the various forms of deviance that (1) result from astrosocial phenomena in terrestrial societies and (2) develop of space settlements/colonies (space societies).
<i>Family astrosociology</i>	Study of how astrosocial phenomena affect family structures and how families and their member cope with social change.
<i>Interplanetary relations</i>	A focus on the relationships that develop between terrestrial societies, corporations, and other entities with those beyond the confines of Earth as space societies become realities.
<i>Medical astrosociology</i>	Space medicine with a concentration on social, cultural, and ethical issues (i.e., medically related astrosocial phenomena) in the tradition of medical sociology and anthropology.
<i>Planetary defense</i>	Study of efforts taken to protect Earth (i.e., identification and defense, if necessary) as well as actions taken should defensive measures prove wholly or partially ineffective.
<i>Political Economy</i>	Study of important questions surrounding how socioeconomic forces impact on space exploration, space research, and spaceflight, as well as any aspects of a growing political and economic system that develops in the solar system.
<i>Religion and astrosociology</i>	Examination of the issues that involve how religious values and norms affect views of space exploration and how these views affect religious groups and larger society.
<i>Science fiction</i>	Study of the interrelationship between space science and science fiction movies, literature, games, and other forms; including how fiction and science feed on one another to produce social change in the forms of advancements and negative outcomes.
<i>Social problems research</i>	A type of applied astrosociology that utilizes space assets to solve and mitigate societal and international/interplanetary negative circumstances in both terrestrial and extraterrestrial settings
<i>Space art</i>	The effects of space-based forms of artistic expressions impact on society's culture and contributes to social change as well as cultural values in a given society.
<i>Space history</i>	Study of historical events and sociocultural change in societies and among societies with special attention to astrosocial phenomena as they affect social institutions, subcultures, and social groups.

<u>Astrosociology Subfield</u>	<u>Description</u>
<i>Space law</i>	Study of formal and informal norms regulating behavior in terrestrial and space environments, including their purposes and consequences.
<i>Space policy</i>	Study of the decisions and actions taken regarding the use of outer space as decided by societies and other entities; including cooperation and conflict in space.
<i>Space societies (beyond Earth)</i>	Study of issues associated with replicating human societies (or other smaller forms of human arrangements) in space ecosystems located in other space environments, traditionally referred to as cities, communities, bases, settlements, colonies, and so forth).
<i>Spacefaring societies (on Earth)</i>	Prediction and identification of long-term trends toward the establishment of a theoretical model of society in which space becomes the dominant influence in society and its culture (i.e., astrosocial phenomena become ubiquitous in everyday social lives of citizens).
<i>Theoretical astrosociology</i>	Development of theoretical models that predict how astrosocial phenomena affect the human condition at all levels of analysis; the study of the human dimension of space exploration.
*- Adapted and expanded from the Table in Pass (2007a). Additional content was added from Pass (2014).	

It is clear from the wide purview of astrosociology subfields, which trace those of sociology and other social science and humanities disciplines and fields, that much work needs to be accomplished before humanity ventures into space in a truly meaningful way. Astrosocial phenomena will affect all of humankind no matter where they reside as space is utilized more effectively and more comprehensively. Human beings cannot easily shield themselves from these effects unless they crawl under rocks or dwell in caves. Living off the grid is possible, but increasingly difficult as the twenty-first century unfolds and the ubiquity of these phenomena increase. Thus, students of all types will benefit by increasing their understanding of space issues by combining STEM and social science together.

VI. A Sample Introduction to Astrosociology Course Outline³⁴

The introductory course offered here provides a comprehensive and flexible learning experience to students in the social and physical sciences, to instructors who wish to incorporate the human dimension of space into their existing curriculum, and to space professionals who seek to understand the relationship between humans and space within the larger scope of their research, experimental and engineering efforts.

This curriculum has been greatly enriched by earlier introductory courses on astrosociology taught by this author at the Kepler Space Institute, by Renato Rusca-Rivera at Meiji University, and by one developed and envisioned by ARI Advisor, Ken Duffy (2010). Their understanding of the pedagogical significance and relevance of astrosociological themes has laid a firm foundation for the current and future incarnations of this course.

A. Course Documentation

³ This course outline was developed for a paper presented at the 100 Year Starship Conference in 2013. It provides an outstanding example of how to organize an astrosociology course that involves real substance. This section is largely duplicated intact from its original source (see Pass and Toerpe 2013). A special acknowledgment goes out to Dr. Kathleen Toerpe who was the co-author of the 2013 paper and largely responsible for developing the course outline contents from earlier work conducted by this author, notably based on the presentation and definition of the course subfields. This offering presents this *Introduction to Astrosociology* to an important and wider audience; i.e., members of the AIAA.

⁴ For another example of an astrosociology course, see Duffy 2010.

This documentation links course competencies, learning objectives, learner outcomes, and core abilities to achieve a comprehensive and integrated curricular platform for this course. Competencies stress the qualitative characteristics of astrosociology, its relevance to space research and exploration, as well as its multidisciplinary connections to the physical/chemical/biological sciences, the humanities, and the arts. The learning objectives for each Learning Module are directly derived from these competencies. Learner outcomes and core abilities reflect a basic alignment with multiple intelligence and whole brain theories. Taken together, the linked components are mutually reinforcing and form the cohesive structure of the course

B. Description

The course units are structured in a learner-centered, inquiry-based approach using guiding questions at the beginning of each learning module to frame the topics. Real-life case studies and newly emerging research, combined with a customized readings anthology (currently being edited by ARI), comprise the main textual material for the course. Assignments will be completed both individually and in teams, promoting collaborative teamwork while stressing individual competency. Pedagogical methods will reinforce critical and creative reasoning skills to encourage students to draw broader and deeper connections among the course themes. Course content can be customized, adapted to fit client semester or session lengths, and can be offered in online, in-person or blended formats. thanks

C. Course Overview

This course covers the basic subfields of the field of astrosociology, as the field currently stands.

Unit 1: Understanding Humanity and Outer Space through Astrosociology

- Module #01 - Introduction to Astrosociology
- Module #02 - Human Exploration of Earth and Space
- Module #03 - Imagining Space Knows No Frontier

Unit 2: Social Dimensions of Outer Space

- Module #04 - Impact of Space Research, Exploration, and Settlement on Earth
(including Applied Astrosociology and Mitigating Social Problems)
- Module #05 - Exporting Terrestrial Societies to Outer Space
- Module #06 - Creating New Cosmic Societies

Unit 3: Enterprise, Governance and Risk in Space Exploration

- Module #07 - Privatization and Commercialization of Space Exploration
- Module #08 - Law and Order in Outer Space
(including Space Law and Space Policy)
- Module #09 - Health and Well-being on Earth and in Space (Medical Astrosociology)

Unit 4: Present Challenges Lead to Future Possibilities

- Module #10 - Extraterrestrial Discovery and Contact (SETI and Astrobiology)
- Module #11 - Planetary Defense in a Precarious Cosmos
- Module #12 - Astrosociology in a Spacefaring Future

Unit 5: Conclusions

- Module #13 - Overview and Discussion of Course

D. Course Competencies

A key objective is to ensure that students gain a mastery of applied knowledge, skills, and abilities measured by the successful attainment of corresponding Learning Objectives that signify the successful completion of this course of study.

- Utilize an astrosocial perspective to evaluate and address social issues and problems on Earth related to outer space.
- Apply an astrosocial perspective to evaluate and address challenges in space research, policy, exploration and possible future extraterrestrial settlement.

- Evaluate impact of astrosocial phenomena, activities and forces on individuals and on core institutions in human societies (family, religion, education, governance, law, medicine, etc.)
- Demonstrate an understanding of astrosociology as a vibrant, multidisciplinary field for both theoretical research and applied practices in the human dimension of space activities.
- Expand collaborative circle of stakeholders in space research, exploration, education and other activities to include scholars, practitioners and students of the social sciences, humanities and the arts.
- Appreciate the cognitive, inventive and affective impact of outer space on the human imagination and its varied manifestations in the applied sciences, engineering as well as the literary, dramatic and visual arts.

E. Learning Objectives

It is important to instill measurable and defined outcomes that demonstrate a student's successful completion of specific learning module content.

Learning Module #1 - Introduction to Astrosociology

- Define astrosocial phenomena and distinguish it from non-astrosocial phenomena.
- Describe the multidisciplinary nature (social and behavioral sciences, humanities and the arts) of astrosociology.
- Explain contributions that astrosociology makes to the study of human activities in space and the impact of space on humans and Earth.

Learning Module #2 - Human Exploration of Earth and Space

- Compare and contrast human space exploration activities over time and across diverse societies, including "push-pull" factors.
- Evaluate the impact of the "Overview Effect" as a catalyzing force for space exploration.
- Identify and distinguish the range of individuals, organizations, institutions and societies that pursue outer space research and exploration.
- Identify social problems that are susceptible to solutions derived from space activities and provide possible solutions and historical examples (applied astrosociology).

Learning Module #3 - Imagining Space Knows No Frontier

- Identify and summarize range of genre (science fiction, gaming, performing and visual arts, etc.) that has fueled humanity's collective space imagination.
- Evaluate the reciprocal relationship between science fiction and technology/ engineering as creating a blueprint for human innovation in the 20th and 21st centuries.
- Propose ways that space imagination and the media forms that express it can be used to further scientific space research and exploration.

Learning Module #4 - Impact of Space Research, Exploration and Settlement on Earth

- Analyze types and impacts of space-related technology transfers and "spinoffs" on different human societies across the Earth today.
- Predict how enhanced computing capabilities in robotics and AI will affect space research and exploration.
- Compare and contrast the STEM and STEMA models of contemporary education. Is one more conducive than the other to producing the literacies needed for the 21st century and beyond?

Learning Module #5 - Exporting Terrestrial Societies to Outer Space

- Identify and analyze the stakeholders (social, cultural, political, economic, religious, etc.) in creating extraterrestrial space settlements and societies.
- Construct a process to determine what elements of terrestrial human societies should be exported to future space settlements and societies.
- Describe ways that human societies on Earth and in space can interact with one another.

Learning Module #6 - Creating New Cosmic Societies

- Construct various social/cultural models of what a future space society might be like in terms of institutions, norms, roles, etc.

- Weigh the relative benefits and disadvantages of robotic vs manned space settlements.
- Identify and evaluate criteria currently used to select astronauts. Will the criteria used to select future space explorers and settlers need to change? Why?

Learning Module #7 - Privatization and Commercialization of Space Exploration

- Evaluate the impact of private entrepreneurial and commercial initiatives on overall space research and exploration.
- Analyze how governments spearhead space research and exploration through policy, legislation and funding (NASA, JAXA, ESA, etc.).
- Explain the role of the mass media and crowd-sourced funding and research in influencing the direction and content of space research.

Learning Module #8 - Law and Order in Outer Space

- Compare and contrast present-day space policy in regulating space research, exploration and creation of future settlements.
- Construct a hypothetical, yet realistic governing structure for a future space settlement or society.
- Describe how political and legal rights in future space societies may differ from those currently in force on Earth.

Learning Module #9 - Health and Well-being on Earth and in Space

- Analyze known human health risks from long-term space exposure and summarize basic treatment protocols.
- Evaluate benefits of space-based medical research for treating terrestrial diseases.
- Identify areas of medical concern for future long-term space missions and settlement.
- Identify ways in which social and cultural factors affect the practice of space medicine.

Learning Module #10 - Extraterrestrial Discovery and Contact

- Analyze the apparent social, psychological and cultural need for humans to answer the question "Are we alone?"
- Compare and contrast different possible contact scenarios arising from the discovery of both microbial and intelligent extraterrestrial life forms.
- Hypothesize on the social, cultural, philosophical and theological effects of never knowing for sure if we are alone in the universe.

Learning Module #11 - Planetary Defense in a Precarious Cosmos

- Analyze how governments and scientists are reacting to acknowledged threats from space (asteroids, solar flares, space debris, etc.)?
- Assess the social and cultural expressions of humanity's concern for Earth's safety.
- Evaluate the effects of class, race, nationality, etc. on how governments and private enterprises prioritize planetary defense.

Learning Module #12 - Astrosociology in a Space-faring Future

- Anticipate and address future ethical dilemmas in law, medicine, social relations that may arise from long-term space exploration and settlement.
- Debate the inevitability of long-term human exploration and settlement of outer space.
- Recommend concrete steps for continued collaboration between the STEM disciplines and astrosociology.

F. Learner Outcomes

Knowledge, skills and behaviors that directly reflect the individual student's learning process rather than mastery of specific content based on mere memorization without a deep understanding. Outcome learner objectives include those listed below.

- Demonstrate oral, written and non-verbal communication skills in an organized and coherent manner.
- Accomplish tasks successfully as an individual or as part of a team.
- Show respect to diverse points of view.
- Analyze and use empirical evidence to test hypotheses.

- Apply ethical reasoning to controversial, multifaceted issues.
- Apply critical and creative thinking skills to a variety of sociological issues.
- Appreciate the diverse origins and expressions of human knowledge and activities.
- Appreciate the dynamic influence of technology in contemporary, industrialized societies.
- Cultivate a personal response to space-related issues and astrosocial phenomena.

G. Core Abilities

Basic individual and social skill sets that are transferable to any setting, occupation, or field of study, include basic learner proficiencies, which are listed below.

- Communicate effectively.
- Think critically and creatively.
- Solve problems effectively.
- Work cooperatively and professionally.
- Value individual differences and abilities.
- Demonstrate personal accountability.
- Demonstrate community and global accountability.

H. Course Implementation

The Astrosociology Research Institute (ARI) is currently exploring formats to launch the pilot session of *Introduction to Astrosociology*. Leading implementation strategies include:

- Accelerated, in-person or online workshops geared to space sector industries as corporate training modules
- Asynchronous online course sponsored by a host institution such as the Kepler Space Institute
- Independently self-produced course offered through a gateway provider such as *YouTube* or *Moodle*, and available by subscription
- Traditional quarter/semester "special topics" undergraduate or graduate course sponsored by a college or university

Multiple, concurrent venues will be explored as ARI's commitment is to provide broad and deep educational support to individuals, institutions and industries interested in applying an astrosociological perspective to their space-related endeavors. To that end, our goal is to offer flexibility in the course's delivery, length and content, and to customize syllabi to suit student, professional, and institutional needs.

VII. Conclusion

The dearth of social scientists and humanists involved in the study of astrosocial phenomena is intolerable as humanity moves forward. To state that many more social scientists are needed to study and conduct research concerning astrosocial phenomena fails to describe the dire situation adequately. While astrosociology has paved the way forward to change this situation, more of those in the social sciences, humanities, and the arts must themselves identify themselves as astrosociologists, just as newcomers began to consider themselves to be astrobiologists. This is happening both within and outside of astrosociology, but the pace of expansion and availability of astrosociology-related educational content need to increase rather dramatically.

The development of astrosociology can only advance so far without the educational component. The need for a growing number of astrosociology educators and students must be addressed. While students can engage in activities offered by ARI and conduct their own astrosociological research, formal structures must be established so that those who pursue astrosociology can earn degrees within the formal pedagogical manner consistent with other college and university majors. Educators have a responsibility to (1) add astrosociology content to their existing courses and (2) promote and develop astrosociology courses as first steps. Even adding content to lectures would help the process.

On the other side of things, students must introduce astrosociology to professors who may not know anything about this field. They can push them to accept term papers, theses, and dissertations about astrosociological topics, as are exemplified in Table 2. Thus, the impetus to place astrosociology into the classroom must occur from the bottom-up via students as well as the top-down via professors and instructors.

The branch of science indicated by the STEM acronym refers to the commonly thought of category that consists of the physical and natural sciences and represents the space sciences to many if not most people in society. For the most part, the social sciences and humanities, which are usually considered to be "soft" in nature, are downplayed and often ignored when thinking about space exploration. This status quo has persisted from the time the first U.S.

rockets were tested though to the modern era in which commercial enterprises have entered the space/NewSpace age. The development of astrosociology encourages social change that results in an expansion of what space science is thought to be, which includes adding the human dimension to traditional definitions. Astrosociology brings the study of human beings into the equation in a much more comprehensive approach that adds astrosocial phenomena to the mix. The social sciences and humanities have a long history of studying human behavior in terrestrial social environments for very good reasons, so it makes sense to extend them beyond the Earth's atmosphere. The study of human behavior and the functioning of societies requires monitoring, application of the scientific method, and publication of the results so that policy makers and others can utilize the results.

The astrobiology model of interdisciplinary action serves more as a long-term objective than a realistic short-term achievement due to the indifference of most social scientists and humanists. It is impossible for these individuals to interact for the purpose of furthering the development of astrosociology when they fail to regard outer space as a legitimate area of research. Astrosociology education is hindered by this current status quo though it is also true that a growing number of them are becoming interested in astrosociological topics and those in the other branch of science can help to bring them along by collaborating so that space issues are better understood. For example, Albert A. Harrison (2015) demonstrated the close relationship between astrobiology and astrosociology as one significant illustration; and, in fact, devoted his professional career as a social scientist to the study of issues related to SETI and astrobiology and other space-related areas of research (Pass 2016b).

A tremendously harmful problem exists, however. While efforts by the Astrosociology Research Institute can increase the number of astrosociologists on a certain level, the fact that the astrosociological frontier remains largely unexplored poses extreme difficulties that the development of astrobiology never faced. It is important for universities and colleges, NASA and other space agencies, space advocacy groups, and aerospace corporations to demand that astrosociology education becomes a mainstream area of education and research. Otherwise, the current circumstances characterized by a lack of social scientific knowledge will persist and the human dimension of space exploration, settlement, and resource exploitation will continue to accelerate without taking into account fundamental understandings involving the human dimension. The likely result will express itself as a growing number of failures and disasters as human beings move out into the solar system and eventually beyond.

The longer the space and social science communities wait to address issues related to astrosocial phenomena and collaborate on issues common to both, the longer it will take to truly understand humanity's place in the cosmos and allow for the most successful outcomes of humans working and living in space. The key next step to achieving a truly holistic understanding of humankind's relationship with outer space and its future potential involves the establishment of astrosociology education as part of the basic approach to space education as a whole. Pioneers on the astrosociological frontier are already working to make this possibility come true, but much more work needs to be done.

Convergence, and therefore formal and lasting collaboration, among all space-related disciplines, fields, and individuals are vital for the future of space exploration, settlement, and resource exploitation. Of course, this is not possible at the moment because social science and humanities students have very few avenues to pursue astrosociology or similar courses compared to traditional subjects. The research presented here and other efforts have demonstrated that outer space is of interest to students in the social sciences and humanities, and they tend to recognize the great importance of studying astrosocial phenomena. Thus, it behooves students and educators at all levels to advocate the settling of the astrosociological frontier while collaborating with others in settled frontiers on the other side of the Divide such as those who study and teach space law, space policy, astronomy, cosmology, planetary science, astrobiology, and planetary defense just to name a few. Without the inclusion of astrosociology education, *human* space exploration can only move forward with half of the knowledge needed to reach its full potential. The status quo is not insufficient.

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Appendix A

In 2011, I asked my followers of the Astrosociology Research Institute on Facebook to respond to my inquiry below. I wanted to find out how their occupation related to astrosociology, if it did at all, since I was strongly of the expectation that most respondents were not social scientists, humanists, or artists. While these data are a bit old, this is the first time they have been presented due to recovery issues that were just recently resolved.

The title of the topic was “Why do YOU support astrosociology? I started the discussion to get things going with the following post:

“Please tell us why you joined this group. What is your occupation and how is a social-scientific perspective on space exploration and settlement to it? If you feel that it is not representative of your occupation, why do you support astrosociology anyway?”

The respondents are not identified except for their initials, which have been changed for some respondents for varying reasons. The discussion regarding these responses is in the main body of this paper under Section Five called “A Random Collection of Views about Astrosociology.”

T.Z.: Kepler raises the stakes of the conversation, and society needs to be prepared for that.

J.I.: As a freelance writer and student of literature, astrosociology is a heady part of what I do, I just never had a term to describe it. Space has affected who we are as a race, and has shaped civilizations in profound ways. Everything from constellation folklore to Martian invader stories falls under this new category. I would be very excited to see more information and opportunities to contribute!

M.A.: In archaeology, we started the discussion about half a century ago, with questions about the motivation, ideology, and thought-patterns of each writing archeologist: what does he/she want us to believe, to follow boundaries, limitations, etc. As the time of “glorious” space-adventures and fierce dual competition has changed, I think it is time to think about the inner issues.

J.R.: I have been thinking of how to frame a proper response in this discussion for a few days now. Please note that I am not a scientist (nor did I stay in a Inn Express last night), but I am a computer Geek, and also have followed the manned space program since Project Mercury. (NASA and I were born in the same year).

I hate to have to mention politics, and funding, but I feel that those two issues have the most direct effect upon manned space exploration in general. And although the ISS is a marvelous example of international cooperation, our species *needs* to get out of low Earth orbit, and onto our neighboring planets and moons.

The monumental undertaking will be a true watershed moment in our history, and we still have the ability to install the needed (and usually ignored) human reaction to the yet to be developed technology that will get us there.

As more and more people have the ability to live off planet, we need to address the issues of how that will impact *both* Mother Earth, and her offspring. How can we avoid the same pitfalls of any other colonization eras? What can we do now to ensure that as few of our sins will follow us as is possible? Furthermore, what can we do now to assist in the effort to model these colonies a way that will allow for them to develop organically, without enslaving them to our greed?

And finally, perhaps the most single fundamental question will be how do we prepare a world that is torn with war, greed, strife, and corruption to not contaminate these new islands of humanity? The answers to these questions is a part of my vision for this group to undertake, and we need to start now!

J.O.: To explore the scenarios for spacefaring civilization of mankind.

H.S.: It is a very interesting approach to ask of the astrosociology and particularly of how social science is related to the astrobiology. It is true that the perspective of astrobiology covers the impact and implication of social human sciences, how the human beings reflect on the mirror of biological existence in outer space, the history of civilization, history of Earth, history of life, let's say everything, and my research theme is the social implication of astrobiology. That is why I join here.

P.H.P. I think Guy La Liberte's mission (with the One-Drop Foundation - dedicated to raising awareness about the need for clean water) is an example of why I am interested in astrosociology: a French-Canadian training in Russia to fly to the ISS on a Russian ship, working alongside Americans and Japanese and the ESA.

Another wonderful example will be the Shuttle Launch tomorrow night. I'm moderating the chat on Spaceflight Now, where we had a quarter of a million viewers from all over the world. I've "communicated" with folks from India, France, Africa, Ireland, and Japan with a common interest and a common goal; barriers like language and culture seem so small.

We indeed have our differences, and understanding and accepting the differences in culture, values, and personalities is being studied because of the ISS. I recently read an article about how different cultures manifest depression, something the psychologists at NASA need to know. It fascinated me, and was probably what got me thinking that perhaps we can use these experiences, along with all these new forms of communication, to learn and grow.

D.M. My profile covers who I am so I will reserve this statement to cover why I'm interested and involved with astrosociology.

As humanity stretches its arms, for the first time with serious contemplation about leaving mother Earth for alternative residences in our solar system and beyond, we are approaching a point where it's imperative that we consider, think about, rationalize, and define how humanity will address its place amongst itself in the cosmos.

Astrosociology serves as a methodology by which we can address serious key issues with respect to space exploration and, eventually, settlement. There is no doubt that human expansion into space will bring about conditions that we have never experienced before as a species. Some of these conditions are natural, such as reduced gravity or micro-gravity and radiation. Some conditions are self-imposed, like social conditions related to isolation, disassociation, separation, and religious conditions that are all terrestrial based.

After future generations are born off the Earth, the issues will be somewhat reversed as returning to Earth will impose special conditions to those who have never set foot on the planet. Will those who have been born or lived extended periods of time off world be accepted back into Earth-based society? Will they be shunned, called "Martians" or "Mooners," or feel a stigmatized as related to their experience? Will they be heroes, showered with praise, or disregarded as nothing special?

In time, an equilibrium state will be reached so that these are all easily addressed, but until then, how these issues are handled in the short term is very important, and the development and study of astrosociology will provide the means by which to analyze these implications.

T.S. I don't think we need another list of why someone follows the space sciences. I think we need a HOW does one support the space sciences...

Response to T.S. by D.M.: T.S., by publicly advocating for space in every way you possibly can... I wrote a book, which is due to be published in 2 to 3 weeks. I'm getting on Fox News to promote it and discuss how space ties into health care, employment, the economy, and more. I'm working on getting on radio shows and writing new papers to discuss it. I will do whatever I can to get every damn person in America to understand how important space is to their everyday life and the future of humanity. :)

J.B.: I am a systems engineer for the ISS National Laboratory Office. I believe that Tsiolkovsky was correct when he said that we cannot stay in the cradle of humanity forever, but that the challenges of the human element will likely prove more difficult than the engineering and scientific problems to be solved. In short, [I agree with] what D.M. said. :)

M.T.: I'm new here. Just wondering whether the same kind of group supporting astrosociology exists in Europe. The people I've heard of come from an environmental sociology stance. (Peter Dickens, for instance). I'm working in the areas of environmental sociology, food and consumption, but I've always been very interested in the outer space dimension and would love to put together research projects in this area. I'm a research fellow based in Portugal (Europe). If there are astrosociology events in Europe already scheduled or to be scheduled in the future, please let me know. I don't think I will manage to participate in the next astrosociology symposium unfortunately,

due to other work commitments, but I'm very interested in following the emergence of this field...and one day hopefully to participate in more activities. I'm aware that the current scientific discussions about space exploration are not seriously/ taking into account ethical and environmental issues, and think our role as social scientists is to bring these issues onto the table, as they are central questions in this debate. Cheers, M.T.

F.M.: I think the timing is pretty perfect.

P.C.: In spite of all that NASA has accomplished over the last 50 years, we really haven't even started buying a space civilization yet. The STS and ISS programs are nice national showcases, but they're not the same thing as a permanent human presence such as what a colony would give.

Astrosociology will be the battleground where cultural politics will be fought. We must remember that culture is simply a method for adapting to the environment. The space environment is unlike anything we're familiar with on Earth, and it will be a certainty that we'll need to invent a whole new culture that can adapt to space.

Do we preserve our utopian ideals in "quarantining" our cultural dysfunctions to Earth and thereby keeping our space civilization "pure," and free from the ethically/ideologically-driven conflicts that lead to wars? Or do we accept the dystopian Social Darwinist approach and embrace conflict, accepting that war is inevitable, have a free-for-all, and even accept that the space colonists we send out today could bring war back here to Earth tomorrow?

Space civilization is a wonderful subject right now because everyone can pour their utopian ideals into it. It is the very definition of "utopia" ("u-" means no and "-topia" means place). But when the time comes when we actually have people living in space, reality will shatter many dreams and dash many hopes.

The white elephant in the room of international politics that no one likes to talk about is space colonization. It presents a whole host of problems. "How do we determine political boundaries? Is the nation-state an obsolete concept with the blank slates of the Moon and Mars? Does it make sense for "nations" (subdivisions of the human population determined by artificial geographic boundaries) to set up colonies? If costs weren't an issue, should we even bother with national colonies?

What would be the best political mechanism to overcome these problems? Coming back full circle to the issue of astrosociology, what should be our guiding principles in making such decisions?

K.R.H.: Hi All, I support the topic of astrosociology because I already got an advanced degree [in a related field] from the International Space University. I took a summer season program course in 2006 for Space and Society, and I realized how many indirect as well as direct benefits that Earth society gets from especially manned space exploration and development. I highly recommend the course. The topic of what will be the benefits of manned colonies in space beyond Earth should be considered a continuation of this topic since the benefits are already so huge for the society we have today.

A.G.: It is clear to me that the day when humanity begins to leave the LEO to permanently settle on other worlds, a new socio-political and economic [epoch will arrive] on that day. Impossible, in fact, to consider seriously the fact that the current system will be exported with prospective settlers (perhaps at first, but the distance and with time, local developments more or less radical will emerge).

It is equally obvious that all this might be the source of new conflicts, see regressions social, economic, and political rather than sources of progress, if humanity has not taken serious preparations.

So, it seems for the moment, here is the place to address these issues, but especially those issues that, once treated, have an impact on the political bodies whose hands lie the conquest of space for the present, as the private sector is embryonic at the moment.

I have a strong desire to do my best to try to bring whatever I could to the process.

K.F.: Why I support astrosociology is a very broad question to me. I personally can write a whole essay on this, but anyway, there are several reasons why I do support astrosociology.

1) I am a medical doctor. However, my heart and mind have always been with the universe and the complexity with which it presents itself to us humans. I personally like puzzles and the universe is one big puzzle that I am interested in. I believe no single body should be given the right to explore the universe, for the universe in all its glory is there for us all and every man, woman and child has a small but an important contribution to make towards our holistic approach in understanding and conquering the worlds that lie in wait for our footsteps.

The reason why we all have to take part is because the universe is a complex place requiring a lot of thought that can't be explained in only one form like complex mathematics or physics. It's only through analyses by all of humanity that we can clearly understand it, guide scientists to its traps and protect the whole of understanding the universe from being hijacked by groups of individuals with personal gains in sight.

2) As a human who was born and bred on this planet by my ancestors, it's my duty to see that when the day comes that humans have to flee our planet or even galaxy that they are well prepared for it, for it's only a matter of time before our very survival as a species may depend on how hard we as humans worked during the preceding years.

3) It is clear that sooner than later we will have consumed most of the available resources that our planet had in store for us and we may have to search for resources elsewhere or fight each other for them. I would much prefer getting them from the vastness of our galaxy rather than killing fellow humans for survival. It's through a project like astrosociology that we can effectively plan for such a day.

4) Ever since humans have been able to understand their environment, they have wanted to go to other worlds, which has been impossible until now, when even space tourism is within our reach, it's our duty to achieve and live those dreams on their behalf and on behalf of those who have worked and dreamed of humans populating other worlds, through the life they passed to us also includes a passed-on dream, and that dream points skyward. Many explorers lived before us, and they risked their lives day and night, and many perished in finding their way around the Earth, it is our duty to continue that struggle, the everlasting struggle to explore far and wide, ever pushing against our limits.

5) Lastly, I would like to say that when exploring space, every human science from art, medicine, engineering, religion, philosophy, physics, mathematics, etc., it can only be done through various generations; so even young children have to be inspired to keep that dream alive through art and science teachings. It is the duty of your institute to achieve that, and even though I am personally far from it, I need play my role in it so as to conquer effectively our final frontier.

G.L.R.: I see astrosociology as an important and growing research area to help understand humankind's varied responses to our increasing discoveries and explanations associated with the space sciences. The transition from global societies to galactic ones will produce a major evolution in our sociological profiles and relationships. This will evolve, not happen [overnight], and how it evolves can be enhanced or retarded depending upon how we learn to understand our reactions to the often-dramatic changes in habitats, cultures, lifestyles, and physiologies.

G.A.S.: Astrosociology is of interest to me as an advocate of human settlement beyond Earth. There are many sociological questions to be considered on many different aspects of human space exploration and settlement. For example:

What would be the proper mix of personality types, genders, and relationships among small exploratory crews sharing a small space for months at a time? There are also questions regarding leadership and chain of command issues between members of spacecraft crews as well as between the crews and their distant Earth counterparts and overseers. There are questions regarding the difference between explorers, pioneers, and pilgrims.

Interesting 'to me' as well is: What is the sociological significance and influence upon, and of, the 'children of Apollo' (those of us who's formative years included Apollo astronauts reaching the Moon) and the sci-fi TV, series such as "Lost in Space" (there's a sociological question – a family being sent to explore space) and "Star Trek."

More questions arise concerning the multinational and multicultural aspects of joint space projects.

Another consideration is the fact that human populations long separated in time will host biological pathogens that other populations will have no immunity to. Will such populations be able to mix? What if strange microbes were found by Mars explorers? Would those exposed explorers be allowed to return to Earth?

There are also question regarding the reproductive viability of space populations. What is the right number of people in a settlement to avoid problems of genetic inbreeding? Will genetic stock brought along in vitro?

How do you build a space settlement so that one crazed member can't just 'blow the hatch' and doom the entire settlement?

I believe astrosociology is a fascinating subject and one that needs to addressed if we humans are to a spacefaring civilization.

M.S.: My current occupation is Consulting Globalist and Ph.D. in international relations, Department of Political Science, University of... In my view, we need astrosociology to be a core part of a standard global undergraduate curriculum as a means to replace scarcity-based global financial capital with abundance-based human capital. Actual peer-reviewed achievement in all fields rather than money in any form would a better standard of success if we are to overcome the multiplicity of threats to humanity in the unforgiving cosmos in which we exist [including] gamma ray bursts, asteroids, comets, freshwater scarcity, disease, climate change, etc.

A.L.: I have no scientific qualifications but was raised and nurtured by my father, a scientist, who had built an observatory in the garden, containing a large telescope. I was given a privileged awareness of the universe before the age of five, being surrounded by telescopes, microscopes, and cameras, and I realized that humans were but a small part of it.

I have a passion to be part of a group that will ensure that wherever humans travel, they will retain an attitude of awe and respect for whatever is discovered and not travel with the cloak of the conquering hero upon their shoulders.

I believe that responsible social behavior starts here, in this group, and needs to permeate the Earth so that the virus of greed is not spread further. I also concur with what D.M. states above.

B.P.: I am a consciousness born at least two centuries too early, and seeing humanity so fearsome of the Great Unknown, I believe it is important to do the human thing by identifying, labeling, and investigating this mystified but crucial part of all of us. Astrosociology is that symbol that we as a consciousness can use to begin understanding our interaction with the cosmos beyond the womb of Mother Earth. We need to start getting off this planet, and this is a good platform to allow us to understand how it affects us.

J.H.: I'm interested in the macro relationships between people, machines, and their dynamic environments. While the interactions between machines and environments are being better understood, we need to see more studies including people. Space is arguably the most dynamic environment for a person to be in, so the more we understand ourselves in space, the more we can understand ourselves.

B.A.: I am a beekeeper and melissopalynologist. I believe it is important to discuss the subject of how we will deal with the problems that we will encounter on long journeys into outer space before they arise. Along with many of the topics above, a few other things we should consider include our development and structuring on long journeys into space that will also depend largely on our ability to interact with, relate to, understand, and appreciate all other forms of life. Our ability to identify and where possible live symbiotically with these forms of life will be important as they will be proficient at extracting energy in order to live and thrive on these off-world planets. As a beekeeper and melissopalynologist, I have experience in living symbiotically with and studying another organism. Socially, another important point is that we will need to maintain a balance of entertainment, music, and poetry as they are integral parts of human society. Identifying and nurturing the skills and talents of children born in outer space will also be critical in maintaining this balance.

N.D.N.: It's not relevant to my job (actually I'm currently looking for a new job), but I did a degree in sociology years ago and I'm now doing one in physical science. I am concentrating on astronomy and hope to have a Ph.D. in

due course. I'm interested in anything to do with space and human behavior from sociological and psychological perspectives. (I'm also a trained counselor), so astrosociology seems to bring together a lot of my interests.

T.F.: Astrosociology is relevant to me because I am a student in medical sociology that will likely see a new age of space exploration in the years to come. I am a strong believer in being prepared, and I'm sure that although we have technology, our social science maturity isn't developed in ways to establish a functioning society in space. That is why I support astrosociology; we need to assess the various social problems that astrosociology faces and develop solutions to those problems. My interests in the discipline include medical/mental health astrosociology, theoretical astrosociology, and social interaction in space.