The Potential of Sociology in the Space Age:

Developing Astrosociology to Fill an Extraordinary Void[1]

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Abstract

As we near the fiftieth anniversary of the dawn of the space age, a curious question looms in the background. Why has the discipline of sociology formally ignored the study of social and cultural patterns related to space exploration (i.e., *astrosocial phenomena*)? There is a void, reminiscent of the false view of outer space as an empty vacuum, represented by sociology's failure to focus on outer space issues. The attempt to develop astrosociology as a reaction to this long-term reality initially met with some resistance and even ridicule. However, more recently, the support for this new sociological subdiscipline continues to increase. Moreover, while the reasons for this avoidance remain only speculative at this time, the study of astrosocial phenomena exists in unorganized forms within sociology and more notably external to it. Although most astrosocial phenomena presently occur in terrestrial environments, their ramifications for space-capable societies continue to manifest themselves in significantly ways. Based on these positive and negative circumstances, this paper addresses some of the issues related to the continued development of astrosociology and the benefits of doing so, using the important example of social problems as the focus.

A Brief Definition and History of Astrosociology

Astrosociology is defined as the study of *astrosocial phenomena* (i.e., social and cultural patterns related to outer space) (Pass 2004b, 2004a). It took nearly seven months to develop the definition and purview of astrosociology beyond a simple notion of *the sociology of outer space*. This included the completion of the first part of the *Inaugural Essay* (Pass 2004a). The definition of astrosociology also involves the study of the relationship between astrosocial

phenomena and non-astrosocial phenomena (i.e., remaining social phenomena unrelated to outer space). The interaction between astrosocial and non-astrosocial phenomena drives a significant level of social/cultural change. Despite this, this area of research remains unexplored.

The informal construction of astrosociology began on December 25, 2002, when I read an article on the web by Allen Tough (1995). The theme of the article relates to the idea that a comprehensive understanding of the consequences of projects dedicated to the Search for Extraterrestrial Intelligence (SETI) must be derived from all the sciences, including the social sciences; that is, the article points out the social implications of SETI. It also implies that the social sciences had largely failed to focus in an organized way on the area of extraterrestrial civilizations up to that moment in time. Tough (1995:6) made a passing comment about the development of something called astrosociology while making a much larger point:

> What will the field be called 20 years from now – SETI, bioastronomy, life in the universe, social cosmology, the study of extraterrestrial civilizations, or simply ETI? Or will the social sciences wholeheartedly turn their attention to the psychology, sociology, anthropology, history, and potential futures of extraterrestrial civilizations? In that case, astronomy may unite with the social sciences to form a new field called social astronomy or *astrosociology* [emphasis added].

Again, beyond the specific reference to astrosociology among several other possibilities, this passage expresses the importance of astrosociology as a multidisciplinary field which involves collaboration among all scientists interested in issues related to space and society. The development of astrosociology thus dictates a two-pronged strategy: (1) its establishment and development as a subdiscipline of sociology and (2) its acceptance and development as a general field of study involving *all* of the social and physical sciences. This paper focuses nearly exclusively on the first part of the strategy though the latter may be of greatest importance to the advancement of science on a general basis (Pass 2005c) as it will require a continuous formal collaboration between astrosociologists and physical scientists.

Space scientists, such as astronomers and astrobiologists, and engineers can benefit greatly by collaborating with astrosociologists (Pass 2006b; Dudley-Rowley 2004). However, any form of collaboration necessitates addressing the historical divide between the space community and sociology. "The cultural and political aspects of the sociology-aerospace boundary on the international scene make for a boundary that draws a crooked and convoluted line over the epistemological landscape" (Dudley-Rowley 2004:6). Recently, the formal breaching of this divide strictly between astrosociology and the aerospace organization of professionals known as the American Institute of Aeronautics and Astronautics (AIAA) has commenced. Progress in this area remains extremely important though it is not the focus of this particular paper.

The *formal* advent of astrosociology began on July 15, 2003 when I uploaded the original pages of *Astrosociology.com*. At that point, I *proclaimed* the existence of this new subdiscipline to fill a void that seemed incredibly to continue within a nation with one of the most sophisticated space programs in the world. Otherwise, the status quo would undoubtedly continue. Instead, the development of astrosociology within sociology, the other social sciences, and even within the space community continues to advance ahead of my original projections. Ironically, our own discipline of sociology may prove to be the largest obstacle to advancing astrosociology in all the sciences. We should not allow this to occur.

Lack of Legitimacy…

Why do astrosocial phenomena continue to exist for nearly fifty years since the advent of the space age without significant recognition or attention by sociologists? Based on personal communications with critics within the sociological community, one reason looms large as a

vital contributor to this problem. Quite simply, human behavior related to space lacks legitimacy as a substantive area of scholarly treatment (Pass 2004c). Is this reasonable?

Peter Berger would think not. He argued that every area of social life deserves scrutiny. In other words, if it exists, then we should use the sociological perspective as a lens to discovery. Berger (1963:18) made this observation quite clearly:

> Thus his questions may lead him to all possible levels of society, the best and the least known places, the most respected and the most despised. And, if he is a good sociologist, he will find himself in all these places because his own questions have so taken possession of him that he has little choice but to seek for answers.

All areas of social life deserve attention (Pass 2005a). Indeed, sociologists have explored most areas of social life with zeal and comprehensive coverage. In contrast, nearly all social phenomena related to space exploration somehow evaded the sociological imaginations of most of those comprising the sociological community, even though these phenomena became most prominent at the dawn of the space age with the successful launch of the Soviet Union's Sputnik probe on October 4, 1957 and the subsequent cold war and race to the moon. Rather than developing a subfield similar to astrosociology in such a dynamic social environment, sociologists slowly created an air of illegitimacy characterized by their historical neglect of astrosocial phenomena. At some point, historical inertia took over (Pass 2005a). Are astrosocial phenomena truly unworthy of sociological inquiry? Incredibly, it seems that the answer to this question, historically speaking, is "yes." It seems that only space tragedies evoked responses from sociologists (e.g., the Space Shuttle accidents).

The true reasons for sociology's indifference and even resistance toward the study of astrosocial phenomena remain unknown at this time, though such circumstances should find illumination in the near future.[2] Until then, advocates can only make concerted efforts to demonstrate the merits of astrosociology in a general way, including the drawbacks associated

with the ongoing failure to investigate astrosocial phenomena. The future must be emphasized because the movement of social groups into space surely possesses sociological implications.

In another context related to a particular society's interest in spending funds on SETI research, I articulated the general arguments favoring and disfavoring solving terrestrial social problems before pouring funds into space programs and projects.

> Solving earthbound **social problems** represents a commonly held alternative use of these funds and scientific resources. Many argue that we should cure AIDS and cancer, solve the energy crisis, defeat terrorism, end poverty and homelessness; and this represents just a short representative inventory. For these critics, space exploration occupies a very low position on the priority list due partly to their failure to recognize its actual benefits. Proponents, in contrast, point to spinoffs and potential solutions to population growth and the energy crisis. Astrosociology, as a science, does not attempt to prove them wrong directly just as a criminologist does not pursue his or her study of crime as an uncompromising moralist. The astrosociological approach seeks to reach an *understanding* of these attitudes in the context of all the others. It seeks to determine how they fit together in the overall cultural mosaic (Pass 2005c:18-19).

The argument favoring the solutions of terrestrial problems before exploring space relates to the status of a subfield like astrosociology in terms of the lack of legitimacy attributed to any approach seeking to understand the relationship between space and society.

If the subject matter of astrosocial phenomena receives assessments of illegitimacy, then the *study* of astrosocial phenomena certainly receives similar assessments. The study of space issues is often tied to various pseudoscientific topics such as UFOs, alien abductions, cattle mutilations, crop circles, and astrology (Pass 2004c). Astrosociology will need to overcome this type of inapplicable criticism so it may survive as a viable field, much as SETI did earlier in the history of the space age (Harrison 2005). The most successful strategy to counteract any misrepresentations of astrosociology by others' utilization of these claims of illegitimacy depends upon emphasizing the *legitimacy* and *relevance* of astrosociology. Accentuation of the positive aspects of astrosociology is more informative to supporters *and* critics.

Astrosociology possesses great implications for sociology as well as the other "social sciences" and the arts.

> An awareness of the cosmic element of human social life is what a sociology of the universe is all about. It embraces history, science studies, politics, philosophy, psychology, theology, literature and art as well as sociology. It extends important themes in the social sciences, asking questions of, and suggesting answers to, problems around globalization, the network society, social constructionism, epistemology, and power. The question as far as I'm concerned is not just whether the study of astrosocial phenomena is worth considering a field of sociology, it is how a critical sociology of the universe can contribute to a better understanding of human social life in general (Ormrod 2005:106).

The contributions astrosociologists will make toward solving terrestrial social problems can well demonstrate the potential of astrosociology regarding a better understanding of human social life and, in fact, their direct contributions may be applied toward improving countless aspects of the social life well into the future. Ignorance of astrosocial phenomena does not equate to their absence while their acknowledgement may well result in a greater expansion of knowledge. Similarly, incorrect assessments as to their illegitimate status remove astrosocial phenomena from a position to assist societies to improve themselves in ways otherwise unavailable to them.

History of "Astrosociological" Research during the Space Age

Much has been written about the space age. Historians most often paid attention to the documentation of events. Philosophers have speculated about its implications. However, social scientists have indeed conducted research concerning important aspects of space exploration in terms of human behavior. Political scientists have analyzed the political dimensions of space exploration. Anthropologists and psychologists (including social psychologists) have conducted valuable research regarding human behavior associated with space. With seemingly increasing frequency, communications scholars have broached topics associated with space exploration.

Probably most notably, psychologists have studied "human factors" starting with the Mercury program, applying psychological principles to practical issues related to the survival of astronauts and their successful use of their equipment.

However, I argue here that something significant is missing. Without substantial input from a sociological perspective adding insights from its absent worldview, a full understanding of space exploration remains impossible. The traditional subdisciplines of sociology offer important findings, principles, and concepts easily applicable to the new subfield of astrosociology. While such knowledge is familiar to sociologists, the same cannot be said for scientists outside of the discipline, and especially for scientists with backgrounds in engineering and the space sciences. The absence of sociology represents a vital flaw in our full understanding of astrosocial phenomena and their relationships with societies. Sociology is missing, but its very absence demands inclusion. This observation is not meant to disparage the other social sciences; the same would be true if psychology or anthropology were absent. In fact, all interested social scientists should consider joining sociologically trained astrosociologists.

What can sociology offer to the existing understanding of space issues? Consider its past. Sociology originally developed approximately two hundred years ago due to the development of a unique approach of understanding social dynamics beyond the individual level that was lacking at a time of tremendous social and cultural turmoil. The major change in focus relates to how human behavior is addressed. That is, sociology developed the unique perspective that human behavior should be understood in the context of society and its component parts (e.g., institutions, groups, and subcultures). A major focus was social change and stability in terms of how they could coexist (without the destruction of a particular society). After all, the founding

European sociologists were trying to understand the monumental events that characterized the transformation of feudalism into a newly emerging industrial society!

Will the next great transformation involve the significant expansion of our human civilization into the ecology we call "outer space"? The concept of astrosocial phenomena is purposely meant to emphasize the social environment as a vital backdrop for shaping human behavior (in space just as on Earth in other areas of social life). The odds likely favor such a scenario in which we transform our current social patterns into those consistent with a spacefaring society model (Pass 2005c; Pass 2004c; Pass 2004b; Gangale 2004). Our discipline should prepare itself to document and understand such a probable future. We can best do so by studying astrosocial phenomena from the past to the present time, and extrapolate into the future. Astrosociology represents a rich additional subfield that can contribute significantly to our current understanding of the space age. An astrosociological approach will allow us to make better decisions as the space age continues to unfold.

Applied Astrosociology

Applied astrosociology serves as a potential contributor to solving practical social problems related to space exploration as well as its potential as a resource for insights beneficial to conducting space policy. Examples include replicating a viable social environment in space (Pass 2006a) and the societal implications of detecting extraterrestrial life (Pass 2006b; 2005c). *Applied astrosociology* refers to:

> ...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. Benefit to society may occur from an astrosociologist's participation in technology transfer for

> medical or environmental applications [for example]. After all, the study of social problems, including their identification and potential solutions, is a longstanding sociological specialty (Pass 2005c:23).

While applied astrosociology focuses directly on solving problems related to space, its indirect application to solving terrestrial issues must receive attention for both practical and ethical reasons. The fact that applied astrosociology can contribute to the solution of social problems on Earth continues to receive inadequate attention. In light of this social reality, the discipline of sociology must end its ongoing avoidance of space issues. The relevance of astrosociology involves its very subject matter – namely, astrosocial phenomena – which continue their contribution to social organization and social change despite the indifference of sociology.

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. For this reason, NASA actively and purposely seeks new applications of its new technologies within academia, industry, and medicine.

While mostly theoretical in its general approach, sociology cannot exist solely as a theoretical enterprise and likewise for its various subdisciplines. For example, it is not enough to simply explain social phenomena such as criminal behavior or poverty. As ethical scientists, we have the responsibility to utilize (or at least make available) derived knowledge toward the solution, or at least mitigation, of our various social problems. The same logic applies to astrosocial phenomena, *even long before the formal establishment of astrosociology in July 2003*. Today, astrosocial phenomena continue to offer solutions for current social problems and

those potentially affecting us in the future. It is partially for this reason that sociology's lack of attention to these phenomena seems so remarkable.

Those who prefer to work as applied astrosociologists may want to study and actively assist in the implementation of practical solutions to social problems. For example, new technologies designed to power advanced spacecraft may find applications in powering homes or automobiles and those designed to produce nutritious foods inexpensively or efficiently for astronauts may find applications for feeding starving people in developing nations. Applied astrosociologists can identify such needs, both obvious to all and unrecognized by the average person, and further devise strategies for solving them in ways that take into consideration sociological concerns such as cultural norms and values, roles, and social-structural opportunities and limitations. Studying social problems from an astrosociological perspective, even when not attempting to implement changes or solutions, may indeed provide others with new ideas that result in meaningful solutions, or at least the steps necessary to move in a positive direction.

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

Defining Social Problems and Astrosocial Problems

The use of space-related knowledge and other assets address some social problems better than others. Poverty, inequality, and deviance represent examples of problems less easily ameliorated by the use of space assets. This is not to say that the severity of such problems

cannot be lessened by space assets through technology transfers and spinoffs from the space program and aerospace community. On the other hand, some social problems are more easily addressed by space resources and therefore receive specific attention later in this section.

For the purposes of this paper, the usual definition of social problems requires slight modifications to allow for a new concept called *astrosocial problems*. Typically, *social problems* refer to "(1) societally induced conditions that cause psychic and material suffering for any segment of the population and (2) acts and conditions that violate the norms and values found in society" (Eitzen and Baca Zinn 2006:11). The concept of social problems involves the objective conditions *and* the subjective assessments of these conditions.

Most sociologists assume that members among the public must perceive that a particular social problem exists and discuss it actively among one another including their participation in its definition. Typical social problems include deviance, mental illness, drug abuse, various forms of inequality, and poverty. Active efforts to solve these problems represent the common response. Social problems may involve violation of norms as illustrated by deviance or violation of values as illustrated by structural poverty in which case the reality of poverty fails to meet the ideals of equality in terms of a minimal standard of comfortable living conditions.

The concept of *astrosocial problems* refers to any social conditions that objectively harm or realistically threaten to harm individuals, social groups, the characteristic living conditions of a particular society, or the norms and values found in that society. Astrosocial problems are not caused by cosmic forces (necessarily); rather they are potentially solvable by astrosocial resources. Unlike the typical definition, this conceptualization of social problems may involve threats to various elements of one or more societies even when public outcry does not exist or no social movement is organized to combat it. The example of global warming serves to illustrate a

problem that can produce severe strains on societies around the world, but one in which some nations fail to agree that it is, in fact, a problem (the U.S. represents the most significant example). The likely impact of a meteor or comet in the future serves as another good example.

Based on this new definition, members of the political institutional sector and other institutions can identify and address *realistic* threats through legislation and public policy initiatives even when unrecognized or underestimated by the public. Assessments of such threats often come from various elements of the scientific community, including the space sciences. As Eitzen and Baca Zinn (2006) point out, however, we must be careful when elites define our social problems based on *their* subjective evaluations. We must be wary of political agendas designed to serve personal rather than societal interests. Still, the adaptation of the usual definition allows for the argument that astrosociologists can contribute to solving our most serious problems and threats in ways currently rarely conceived by current policy makers. The concept of astrosocial problems assumes that the application of astrosocial phenomena can contribute significantly to solving social-structural troubles found in specific societies and even those threatening humankind.

Solving Specific Social Problems

Undoubtedly, the criticisms of those opposed to space exploration, and those opposed to the study of it from a sociological perspective, hold enough merit to deserve serious examination. Of specific interest here is the refutation of the general argument that "we should solve our problems on Earth *before* we seriously consider spending billions of dollars to satisfy the whims of space enthusiasts" (Pass 2004c, 2004b). Critics of space exploration, including sociologists, fail to regard space exploration as strongly related to everyday social life and thus fail to view it

as worthy of sociological inquiry (Pass 2004c). This position reflects a fallacy for a number of reasons as discussed below.

Probably the best way to demonstrate the importance of astrosociology in the context of solving terrestrial social problems lies in a simple listing of some of humankind's most consequential problems, and then in a presentation of some proposed solutions from an astrosociological perspective. In general, the ways in which particular societies individually and cooperatively identify and then seek solutions to these social problems fall under the purview of astrosociology when space assets are utilized as part of the solutions employed, both in terms of people and other types of societal resources. The solution to any particular social problem involves astrosociological concerns when it involves *astrosocial phenomena* – that is, when human beings organize themselves and space assets in ways centered on addressing any particular terrestrial problem. Earlier in this section such social phenomena were defined as astrosocial problems.

The following list includes some of major astrosocial problems that probably necessitate solutions involving significant astrosociological input (Pass 2004c). Ultimately, each of these problems impact currently or potentially on societies and the human species in general. Many of these problems are interrelated to some extent.

> ● **Explosive population growth** – the existing solutions most often involve harsh efforts to reduce fertility and birthrates in various ways, often violating cultural traditional norms and values. **Space based solution(s):** moving a proportion of Earth's population into space represents a difficult proposition, but it may prove the best solution to overpopulation.
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> ● **Energy crisis** – non-renewable energy reserves will eventually run out while terrestrial-based renewable energy sources remain inefficient, unworkable, and costly. **Space-based solution(s):** possible solutions include beaming the Sun's energy from satellites around the Earth or from stations located on the Moon, the use of technology transfers (e.g., fuel cells and hydrogen systems), and eventually the mining of asteroids and other cosmic bodies.

● **Global warming/Greenhouse effect** – the possibility of our terrestrial biosphere heating up due to human-created contaminants would bring about tremendous changes, including a dramatic decrease in our land masses, not to mention serious climate changes. **Space-based solution(s):** utilization of space scientists and space assets such as satellites to study the problem can bring about a greater understanding of the problem for Earth and applicable findings for other planetary bodies; this would include more accurate projections about future consequences and thus earlier intervention.

● **Pollution and other forms of environmental stress** – contamination of air, soil, and water as well as other forms of environmental stress contribute to global warming, the greenhouse effect, and acid rain. **Space-based solution(s):** a good example involves a technology transfer adaptable to improving catalytic converters for automobiles and possibly scrubbers used in industrial factories.

● **Destruction of habitats** – the damage to, and even annihilation of, elements of the biosphere we rely upon for our very survival (e.g., old growth forests and rainforests) may eventually lead to the situation in which too little oxygen exists for us to breathe; and the survival of other species hangs in the balance as well. **Space-based solution(s):** space assets may prove necessary to artificially increase oxygen levels on Earth should the current natural system become overburdened. Will we need to terraform our own planet?

● **Global catastrophes** – vast losses of human life due to events such as pandemics, earthquakes, tsunamis volcanic eruptions, and devastating weather phenomena remain continuing threats to our species. **Space-based solution(s):** again, the movement of peoples in the highest risk areas to space colonies will someday prove less of a threat than remaining in these terrestrial danger zones; control of natural climatic and earthborn systems represents an important goal for the future.

● **Impact by a cosmic body** – the probability increases of an asteroid or comet striking the Earth with enough mass to either wipe out the human species or greatly reduce its overall population size in which case entire societies and civilizations become reduced to stone-age technology. **Space-based solution(s):** detection and diversion of such a body obviously depends greatly on astrosocial phenomena, both in the form of terrestrial infrastructure and space-based assets.

● **Military technology obsolescence/ Military obliteration** – military technology remains advantageous over potential enemies for only a brief moment in history making innovations a constant necessity; on the other hand, this ongoing increase in capability may someday destroy all of human civilization. **Space-based solution(s):** for those responsible for maintaining a strong military, technology transfers from NASA and the aerospace industry to develop new military hardware greatly assists in the seemingly never-ending effort to conduct

> cutting-edge warfare. The problem of the obliteration of the human species from nuclear warfare or by newer technologies yet to be developed may be prevented by new defensive innovations made possible, in part, by the space program and the aerospace industry. And, of course, terrorism provides a wild card in terms of the use of weapons of mass destruction.

The common thread uniting these existing and potential social problems relates to the inability of the human species to solve them without the use of space assets. For example, even today, space resources are utilized to help understand destructive weather patterns, assist in the location of new energy reserves and track patterns of rainforest destruction. Understanding the nature of dwindling and changing ozone patterns serves as an additional example.

In my *Inaugural Essay* (Pass 2004a and 2004b) which introduced astrosociology and addressed the need to develop it as a new subfield of sociology, I pointed out that societies will need to adapt to changing environmental conditions that will alter their social structures. The economic institutions around the world will need to endure additional strains if we continue to rely solely on terrestrial resources (and ignore the availability of space resources). Such a scenario would almost certainly vindicate Malthusian theory!

> The space sciences can offer unique solutions to many social problems, and that assists their cause…As one example, the finite resources on Earth make it attractive to consider the mining of space-based resources (Hardersen 1997; Lewis 1996). Space represents a new economic frontier with untapped potential that inevitably draws greater attention. As Earth-bound natural resources decline, the shift to space resources represents a logical new focus for economic activity. At some point, the benefits outweigh the costs as science and technology continue to advance (Pass 2004b:24).

Obviously, space resources are currently underutilized by all societies. Because the economy serves as the "engine of society," the dwindling availability of terrestrial sources of energy and materials will cause this figurative engine to stall unless new sources become regularly available. At some point, the investment in space infrastructure will be made in order to pave the way for a more productive future.

All of the examples above beg the following question: If astrosocial phenomena already exist to assist in the understanding and solution of these critical social problems, then why does sociology as a discipline resist the study of these problems and solutions in an organized and consistent manner? There can be no greater reason to conduct sociological inquiry than when serious enduring social problems exist and solutions from nontraditional sources may provide significant alleviation. Astrosocial phenomena exist as expressions of social organization directed at space exploration and space travel most directly, but they will likely prove valuable as indirect applications for solving many common social problems.

This is not to say that the subfield known as the "sociology of science and technology" does not involve these types of issues or that the "sociology of organization" has not addressed organizations in the astrosocial sector (see Pass 2004a). However, one cannot seriously state that the specific focus on astrosocial phenomena exists in any sociological subdiscipline to any significant degree of consistency or focus. The development of astrosociology is required to bring this particular area of study to a level of recognition and respectability consistent with its relevance to solving social problems as well as to solving other aspects of social life. Sociology should recognize astrosocial phenomena as the subject matter of astrosociology and examine these phenomena in the normal manner consistent with sociological inquiry.

Thinking about Social Problems from Beyond Our Home Planet

Today, our serious social problems occur on our home planet. Most of us view our terrestrial problems as requiring terrestrial solutions. As sociologists, we focus our research on dimensions of social life that seem most familiar to us. By thinking *astrosociologically*, we can

expand our understanding of social problems and increase the potential solutions employed to address them. The example of our educational crisis serves as a good example.

Difficulties in providing effective education at the elementary and secondary levels comprise a significant contemporary social problem. The fascination with outer space among our youth should be expanded in unconventional subjects and disciplines.

> 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] (Pass 2006b).

On the Earth, the social problems related to education could well ease with the introduction of space-related materials to nontraditional subjects. Our capacity to excite young students about any topic can have the effect of making them take education seriously. For example, a great number of physical science and engineering teachers have taken advantage of NASA resources and programs to interest their students in particular subjects. Social science teachers should use the same techniques by linking space to society. While NASA provides few resources for such an approach, teachers can easily use their imaginations to develop their own curricula based on resources that exist for other purposes. They can also place pressure on NASA to delve into the social sciences, ideally by accepting astrosociology as a legitimate field.

One exciting element of astrosociology involves stimulating the sociological imagination of sociologists and other social scientists to look beyond the confines of social life on Earth. For

our discipline, astrosociology can serve to bring sociology into the space age, a place where it has refused to go for nearly fifty years. Yet the very definition of astrosocial phenomena links human behavior with space, and therefore sociological inquiry remains highly relevant to human activities in space.

> The promise of sociology resides in its potential capacity to recognize the connections between individuals and both the social structures and the cultural communities comprising their society (Mills, 1959). This fundamental application of the sociological imagination seems obvious when considering the historical development of the discipline, and its attention to "normal" social phenomena. However, the ongoing failure to apply the sociological imagination to an understanding of astrosocial phenomena demands special consideration of astrosociological issues. Modern human activities in space and related to space, characterizing the *space age*, have been taking place since the 1950s, yet their impact on society over the years is largely unknown due to a significant level of sociological indifference and perhaps even a certain level of contempt. The establishment of astrosociology serves to end this failure (Pass 2004b: 5-6).

Astrosociology becomes increasingly important for understanding those aspects of social life that relate to space, of course, but it also provides the basis for contributing to the potential solutions to social problems in space *and* on the Earth.

As space exploration becomes more sophisticated, and humans venture beyond low Earth orbit on a regular basis, astrosociologists will turn their attention away from the Earth more frequently. As already demonstrated in the list of social problems presented earlier, some of our terrestrial social problems can be relieved to an appreciable extent by moving part of our population off of our home planet. Arguably, the more interesting topics of this subdiscipline lie farther away from the Earth due to their unknown conditions humans will encounter as well as the unrealized possibilities for humanity.

Overall, the attention paid to the Earth will not wither too much, however, as the bulk of humanity will remain on terrestrial soil for untold centuries to come. Astrosocial phenomena will continue to play out on the Earth to a high degree as it serves as a homeport of sorts. A

relatively small number of individuals will live and work in space for various reasons. For those who do so in efforts to solve social problems, whether they are astrosociologists or others, their contributions will assist people and their societies on our home planet in ways unavailable solely on the Earth itself. The question arises once again: Does it make sense to forego utilization of solutions related to outer space? Based on the foregoing discussion, it would seem clear that the simple answer to this question is an emphatic "no." It makes no sense to consciously or even unconsciously forego astrosocial solutions to harmful social problems. Furthermore, it makes little sense to continue our ignorance about astrosocial phenomena. Because astrosociology involves the intersection between human activity and outer space, it includes any organized human activity relating to space whenever humans venture into it physically or even remotely observe its phenomena which, of course, all constitute astrosocial phenomena. Derived solutions from astrosocial phenomena can serve as a significant source of additional tools to counter social problems. For such reasons, applied astrosociology must be viewed as a legitimate element of our sociological discipline.

Conclusions: The Astrosociology of Social Problems

As the original founder of astrosociology, I remain gratified with the pace and level of progress associated with the development of this subfield. On the other hand, astrosociology is by no means a mainstream subdiscipline within sociology. Its development depends upon placing continuing pressure on those within the discipline who serve as gatekeepers. Based on sociology's conspicuous absence throughout the space age, the importance of this pressure by astrosociologists and supporters of astrosociology cannot be overemphasized. The nature of this ongoing problem necessitates overcoming criticisms but most importantly making the credible

case for the indispensability of astrosociology as societies advance and move farther into space. As this occurs, the importance of astrosocial phenomena on terrestrial soil will increase in their importance to social life as experienced by ordinary citizens.

This paper serves as another important contribution to pressure sociology, the other social sciences, and the humanities to develop this new subfield through the demonstration of its relevance to sociology in the twenty-first century (Pass 2004b). Moreover, this pressure extends to the physical sciences, most notably to the space sciences and engineering disciplines, to adopt astrosociology and collaborate with astrosociologists to develop a well-rounded understanding of human space exploration. A great potential exists for the application of new astrosocial technologies and scientific breakthroughs for solving the seemingly intractable social problems currently plaguing societies around the world as well as those surely to develop in the future. In our unfolding reality, all the sciences are relevant to our survival.

For nearly fifty years during the course of the space age, the space program continually contributed to improving the safety and living conditions related to a great many dimensions of social life.

> Rather than a "waste of money," the space program of a particular space capable society serves to solve *social problems* on Earth…Someday, NASA's research may even contribute to saving our species. (The dinosaurs would have benefitted from a good defense against asteroids!) Of more immediate concern, one only needs to consider a few of the obvious examples in the fields of medicine, environmental and other Earth sciences, computer science, industrial design, consumer goods, aeronautics, astronautics (of course), law enforcement and military weaponry, and Earth-based engineering to gain a general appreciation. NASA-sponsored research contributed strongly to the development and improvement of technologies such as the laser, miniaturization and reliability of electronics, satellites (including GPS), x-ray machines, CAT scans, and advancements in public flight safety. The Earth sciences constitute an important component of space exploration. For example, NASA satellites, including advancements in remote measuring instruments, contribute to improving our understanding about hurricane formation and prediction *now*. The applications of such technologies to terrestrial social problems prevent injuries and save lives on

> Earth. In reality, then, a great number of the benefits do not manifest themselves as monetary gains even though they are just as important for a particular society. The pursuit of space exploration produces improvements in social conditions (Pass 2004b:13-14).

If this is indeed the case, then why does sociology still fail to focus on astrosocial phenomena in a serious manner? This status quo will change as astrosociology continues to develop into a legitimate subdiscipline and attract a significant number of followers along the way. The historical indifference demonstrated thus far cannot continue as a practical matter.

The *astrosociology of social problems*, focusing on astrosocial problems, could well become a popular specialty among astrosociologists. It seems like a logical step to extend our knowledge related to astrosocial phenomena to help solve the terrestrial problems of societies as the social sciences and physical sciences learn to collaborate with one another on a formal basis. Applied astrosociologists may contribute to planning space missions in ways that develop technologies for both the mission itself and for the benefit of a particular society. It may cost additional resources though the outcome potentially compensates for the initial cost due to the application of the new technology in two or more areas.

Some critics claim that the discipline of sociology becomes less relevant when unnecessary subfields such as astrosociology contribute to its fragmentation (Pass 2004c). On the contrary, astrosociology can bring together disparate ideas currently dealing with space separately into a single subfield (Pass 2004c). In a way, it represents a new source of fragmentation because astrosociology did not exist before 2003, but its greatest effect is to bind the discipline together. If the general public is any indication, astrosociology may serve to partially revitalize our discipline (Pass 2005a). The general public generally supports space exploration in the United States (based on ongoing responses to Gallup polls). Many of these individuals must be of college age or younger, so those who lack the aptitude or interest in the

physical sciences may opt to study their interests in space issues from a sociological perspective. This can potential revitalize the discipline by drawing a new source of sociology majors and minors (including those from astronomy programs, for example).

While the sociological perspective possesses the great potential to improve upon the understanding of the relationship between space and societies, the sociological discipline largely lacks the foresight to take advantage of its own potential. For this reason, advocates of astrosociology must continue to make their case within an indifferent and potentially hostile sociological community. The payoff looms large both for the discipline of sociology (despite itself) and a greater understanding of a void within social life that remains mysterious to many social scientists due to inattention.

Development of a formal, organized approach dedicated to the study of astrosocial phenomena (namely, astrosociology) focuses sociological inquiry upon an area of social life largely unexamined yet highly relevant to the future of humanity. The solution of social problems require input from all elements of society whether or not they are "in vogue" while these social problems continue to harm individuals and social structures. Astrosociology is both overdue and relevant due to its potential to contribute significantly to the solution of social problems, but also due to a better understanding of how modern societies change and how astrosocial phenomena intersect with human social life during all historical epochs.

Ultimately, the work of astrosociologists will demonstrate the connections between space and society, including how astrosocial phenomena can improve living conditions for people in societies throughout the world. Astrosociologists will fill the *extraordinary void* with quality theory and research, and applied astrosociologists will provide previously missing contributions toward the solutions of social problems. Current subdisciplines, including the sociology of

science and technology, largely ignore astrosocial phenomena. Early astrosociologists will serve as pioneers who assist in shaping the foundation of this growing subfield into the foreseeable future. Those who focus today on issues related to science and technology, and possess a strong interest in space, should seriously consider entering the field of astrosociology.

In actuality, one should not need to justify the development of astrosociology on the basis of its contribution to solving social problems. It can stand on its own merit. The potential of sociology is unlimited in terms of its contribution of innovative insights and unique research. Astrosociology fills an extraordinary void rarely addressed by sociologists or those in the subfields of other disciplines. Just as space was proven to consist of more than simply an empty vacuum, astrosociology will prove to be more than a redundant (or otherwise unnecessary) subdiscipline. Professional organizations and the various science/technology subfields have failed to address astrosocial phenomena. We should formally correct this longstanding omission. One very important side benefit, of course, *does* relate to the possibility of addressing those social problems that are most directly solvable by the utilization of astrosocial phenomena (that is, by concentrating on astrosocial problems).

Notes

1. This paper was presented as part of the Sociology of Science and Technology session at the Pacific Sociological Association (PSA) conference held in Universal City, CA in April 2006. I wish to thank John Parker from the Arizona State University and original chair of this session for his foresight and courage relative to accepting an astrosociological paper at this rather early stage in the development of this subfield.

2. Currently, Dr. Marilyn Dudley-Rowley, Thomas Gangale, and I are working on a project involving a survey of ASA members' attitudes about the importance of studying space exploration and the development of astrosociology. A preliminary paper was presented at the California Sociological Association (CSA) conference in November 2005.

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