

# Moon Bases as Initial “Space Society” Trials: Utilizing Astrosociology to Make Space Settlements Livable

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**Abstract.** As we prepare to go back to the Moon on a permanent basis, it behooves us to take advantage of our return to the Moon by increasing our knowledge base so as to make all aspects of survival possible. The standard approach remains fixed on meeting the challenges related to power, physical habitat, and others associated with the *physical* environment and *personal* survival. While this traditional facet of space settlement must be addressed in a successful manner, the other set of variables to the equation for human survival in space receive little attention. In other words, we tend to focus so strongly on getting to a location and setting up a physical habitat that we overlook what it will require to survive in our new *social* world once the physical environment is functioning properly. We should take care now to begin formal consideration of the psychological, social, and cultural realities that will exist once we arrive. Plans starting with the very first Moon base should integrate research objectives that both (1) construct the integral physical elements of an isolated habitat and (2) study how the new social system operates subsequently. In fact, we should involve social scientists in planning as many of the latter issues as possible before the mission begins. This dual approach will serve as a first step to acquiring the critical knowledge necessary for human beings to live in isolated space environments situated too far away from the Earth that practical assistance is not readily available. Astrosociology, being a multidisciplinary social scientific field, can serve to unite social scientists interested in space research to work together on this issue and others in a formal manner. This, in turn, will make it possible for them to collaborate with space scientists and engineers in order to foster a fully comprehensive approach to make space settlements livable on a long-term basis. This collaboration, involving natural scientists and social scientists working together for the common goal of implementing sustainable space societies and conducting relevant research to improve the next project, represents a fundamental shift to a new paradigm currently unfamiliar. This paper lays out the basics for this new paradigm, for consideration by both the social science community and the space community.

**Keywords:** astrosociology, Moon base, social environment, sociology, social sciences, space colony, space society.

**PACS:** 87.23.Ge, 01.75.+m, 89.65.-s, 89.65.Lm.

## INTRODUCTION

The era of human space exploration that relies on the engineering elements to assure a successful spaceflight is drawing to an end. Flying in circles above the Earth and then returning to terrestrial soil after a few days will characterize the space experience for only a limited time from this point onward. Humankind is destined to expand its presence throughout our solar system and eventually beyond. We find ourselves at the doorstep to the rest of the universe. Unlike past missions, future ones will venture farther away from the Earth. In doing so, the social groups that move outward will find themselves less able to interact with a “mission control” or any other terrestrial entity (Gangale, 2004). They will be on their own, essentially, whether they favor or disfavor this scenario. Soon, diversion from this historical pattern will become essential to allow for progress.

Presently, we find ourselves at a critical point in which plans to place a human settlement on the Moon provide us with an invaluable opportunity. We will construct a long-term physical environment on another planetary surface. From the beginning, we should treat these types of early settlements as *remote* human outposts so we may collect invaluable data regarding our ability to live in isolated space environments. Interacting with these settlements using the Apollo-Shuttle-ISS protocol would fail us in our quest to make livable space societies possible, though we can still learn much from these projects (both past and present).

While communications with lunar inhabitants can occur in near real time, for example, we should not run the lunar outpost in this fashion. We should build in a time delay between communications to foster a feeling of isolation among the inhabitants with the

caveat that emergencies receive immediate attention. In this way, we can collect the data applicable to a distant and isolated settlement without the same level of danger. We should proceed as if the base is light-years away from the Earth.

This approach allows researchers to evaluate the issues involved with deep space settlement long before we have the technical means to reach such a location or construct a physical environment capable of operating without input from controllers on the Earth. This data will become indispensable as we move outward from our home planet while simultaneously providing insights about social groups and societies on the Earth. In other words, the same data will possess applications for both extraterrestrial *and* terrestrial social life.

Approaching the construction of space societies utilizing a social science perspective does not reflect a new idea although its implementation remains limited in practice. For example, Harrison, Clearwater and McKay (1991) argued that research regarding social groups in isolation on Earth (e.g., submarines, historical data regarding expeditions, and Antarctic base crews) must increase. Additionally, we should continue to collect traditional types of data from the ISS as medical and physiological data related to the dangers of living in space (e.g., radiation and the effects of “weightlessness”) pose serious threats. While these areas of research do deserve attention due its obvious application to space societies, we must also move beyond this approach to include theories and principles from “regular” societies, both contemporary and past. We should move beyond terrestrial and space crew models in our future planning as they represent a past paradigm rather than the future course of history.

The ideas contained herein center around the main concept of adding the social science dimension to the current approach. The social environment must receive greater attention. At the same time, this must occur without shortcuts taken to ensure a safe physical environment. Many challenges face humanity’s desire to live among the stars including the construction of reliable hardware and countering the effects of cosmic and solar radiation. We must work hard on both fronts which involves bringing in dedicated astrosociologists to the current effort. A most critical goal requires accomplishment: we must develop astrosociology into a credible and universally recognized field so that (1) social scientists can organize themselves to construct a single body of knowledge and its related literature and (2) space scientists and engineers can formally collaborate with the social scientists interested in space research.

Diversification from the current historical pattern requires the development of astrosociology and the utilization of its contributions by the space community. While its absence in the past was tolerable due to humanity’s proclivity to stay in its own backyard (i.e., the Earth-Moon system) (Pass, 2006b), our future expansion into the solar system calls for a new approach. Humanity’s movement into space and the construction of permanent societies beyond the confines of the Earth will inevitably require the involvement of social scientists on a much greater scale and a much higher level of involvement.

By introducing this paradigm, the author hopes we can begin a new era characterized by the amassing of the knowledge required to move methodically toward the construction of more and more sophisticated space societies. One objective seeks to motivate social scientists to participate in implementing the new paradigm proposed here. A related objective involves changing the mindset of space scientists and engineers so they accept the new paradigm, including taking advantage of astrosociological input.

## **DEFINITION OF “ASTROSOCIOLOGY”**

In the present discussion, the definition of astrosociology becomes important. The basic definition of *astrosociology* is the scientific study of astrosocial phenomena (i.e., the social and cultural phenomena related to outer space) (Pass, 2005a). In essence, astrosociology focuses upon the various connections between social interactions related in some way to outer space and human societies. These connections operate in both directions between the two. And while most astrosocial phenomena currently occur on terrestrial soil, this social reality will change as human beings venture into space in greater numbers and farther away from the Earth. As one may well imagine, astrosociology involves a large scope of substantive areas and thus a large number of specialties. The study of space societies represents only one of them, but an important focus for the future to be sure. For reasons related to space exploration and space exploitation, from a solution to overpopulation and religious freedom, humans will eventually leave their home planet in the future. Astrosociology now exists to document and study these trends.

Astrosociology represents both (1) a new subfield of the sociological discipline and (2) a general social science field that also incorporates the behavioral sciences and humanities (referred to hereafter as the “social sciences” for brevity). A potentially important set of benefits of astrosociology related to the second element involves the binding of social scientists interested in space issues and thus a more easily identifiable community to collaborate with the space community. This potential should receive the consideration it deserves as a potential reality that would forever alter our current approach which relies almost exclusively on the natural sciences and engineering principles. The interactive aspects of the natural and social sciences will generate new ideas and procedures currently unimagined.

The discussion to follow touches on many of the issues related to the place of the social sciences in space research. It should become clear to the reader that the old way of doing things within the space community cannot continue. Future success relies on addressing the growing reciprocal needs between the natural sciences and the social sciences. Historically, the limited interactions between the social science community and the aerospace community are best characterized by what Dudley-Rowley

(2004) has termed the “great divide.” Astrosociology now exists to make this relationship possible through the development of an easily recognizable field on the social-science side that was previously missing. Once that is in place, and accepted by both the social-science community and the space community, astrosociology can potentially provide the capacity to bridge this “great divide” (Pass, 2006b). Inherent in such a possibility is the desire on the part of both communities to want formal collaboration. This result would counter historical patterns from the past and therefore represents a difficult accomplishment to achieve. Its success would bring about unprecedented progress, however.

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

The need to bridge the “great divide” does represent a growing need for both sides of the chasm. Astrosociology can serve as the bridge to accomplish this due to its attempt to organize the social sciences and its stated goal of fostering formal collaboration with the space community.

## DEFINITION OF “SPACE SOCIETY”

The term *society* refers to “a population that is organized to carry out the major functions of life” (Kornblum, 2005). This definition infers a substantial level of organization at all levels of social reality (i.e., micro, middle and macro levels). For a society to exist, either on the Earth or in space, a complex set of stable cultural and social patterns must provide guidance and organization for the population. Ultimately, a society implies a social environment, but more importantly, its organization and stability. This realization requires a much greater emphasis on the preferred characteristics that define a potential new society in space. The foremost functions of life must be defined and addressed. Otherwise, unintended consequences may counter the ability of any society’s ability to carry out the important functions of life in a successful manner. This area of research and planning currently garners little attention despite its criticality.

The term *space society* is preferred over the concepts of *colony* and *settlement* from an astrosociological perspective because it places the focus upon the social environment. It also infers that the substantive areas covered by the social sciences require a new emphasis when it comes to conducting research and implementing solutions related to putting humans in space.

For present purposes, *space society* is defined as a space colony/settlement in which members of the population (1) share a common culture, (2) live within a closed physical environment, and (3) cooperate with one another, social groups, and institutions in order to meet the social needs of all its citizens (Pass, 2006a).

The enclosed nature of the space society makes it imperative that it functions successfully as a social system. (It is highly doubtful we will locate and then arrive at a habitable moon or planet in the foreseeable future).

Inhabitants must solve their own problems, whether mechanical or social, so the construction of a livable social environment remains a critical goal. The definition of society above involves more than merely solving problems. Everyday social objectives require fulfillment as do the macro-level goals. While social problems must receive attention, the necessary positive requirements of the population represent a much greater concern and can contribute to the prevention of negative social patterns that would otherwise potentially arise.

## Social Environment, Social Structure, and Culture

The mere action of placing two or more individuals in an enclosed physical structure on the surface of the Moon creates a social group (i.e., a dyad) and a social environment. However, the existence of a population within a social environment does not equate to a society by itself. Something more is required. *Social structure* refers to “the recurring patterns of behavior that people create through their interactions, their exchange of information, and their relationships” (Kornblum, 2005). Even without initial planning, social structure would still develop just through the social interactions of the inhabitants although it may not evolve into an optimal arrangement. Emergent social structure refers to its components, statuses and roles, arising due to new adaptations that occur. The ability to adapt to new social conditions reflects a vital capability. Still, planning the details of social organization is vital to creating a constructive overall social structure within the social environment. There must be a starting set of conditions. The planning process represents an involved and complicated effort.

The problems associated with overlooking the social environment require a bit more emphasis. Without planning, the outcome may be unworkable or, worse, destructive in some manner for the inhabitants. Chaos and conflict are more likely to develop

without prior planning. Think about the “wild west” during the settlement of the western United States, for example. That level of violence within the confines of a space habitant obviously cannot occur without greatly jeopardizing the entire population. Unplanned social environments must not be allowed to establish themselves, though this represents the current approach due to the lack of involvement of sociologists and other social scientists.

We need social scientists to assist in the construction and implementation of a system of social institutions including government, economics, education, health, family, leisure, and criminal justice system (Pass, 2006a), a basic yet important idea that Rudoff (1996) called *orbiting institutions*. Rudoff (1996) also called attention to the importance of *orbiting communities*. A long-held type of optimism among many non-social scientists, as well expressed below, characterizes the importance of paying close attention to constructing the space settlement as a *society* that possesses great complexity, yet great potential:

More important than material issues, I think there is reason to hope that the opening of a new high frontier will challenge the best that is in us, that the new lands waiting to be built in space will give us new freedom to search for better governments, social systems, and ways of life, and that our children may thereby find a world richer in opportunity by our efforts during the decades ahead (O’Neill, 2000).

Again, such hope can only receive fulfillment through careful deliberation and planning involving the input of astrosociologists.

Social structure remains inadequate without proper guidance. Cultural considerations must be planned as well. What are the priorities of the space society? What things are valued and what things are opposed? How do various social groups and categories of citizens fit in the overall scheme of things? *Culture* refers to a combination of ideas (including values reflecting what a society values), norms (or social rules of behavior), and material culture (the physical manifestations of society). These are known as Bierstedt’s (1970) three dimensions of culture. The overwhelming influence of culture on a society cannot receive too much emphasis as it represents a ubiquitous influence as stated by the following definition:

We can define *culture* as all the modes of thought, behavior, and production that are handed down from one generation to the next by means of communicative interaction – language, gestures, writing, building, and all other communication among humans – rather than by genetic transmission, or heredity (Kornblum, 2005).

This definition emphasizes the fact that a culture is based on *social learning* rather than by any type of biological process. This implies that a new space society will lack a unifying culture without prior planning. In a worst case scenario, individuals will simply come into the space society bringing their own cultural baggage with them. And depending on what nations they come from and which subcultures they belong to and identify with, their unique backgrounds may contribute to the conflict within the population. Even with planning, inevitably an adjustment period will occur. However, it would be easier for the new inhabitants if a culture already existed so that they could attempt to assimilate themselves into their new environment.

One difference from Kornblum’s definition above relates to the idea of transmitting culture to the next generation. When we construct a space society, we must develop or perhaps transfer a culture from the Earth to the same generation that will govern and control various elements of the space society. An important consideration relates to the idea that deliberate decisions must determine the details of the space society’s cultural framework. While there is no guarantee that the initial cultural structure will continue in its original form for very long, it can provide a source of stability to the social environment.

In conclusion, initial planning must take place before the mission begins, monitoring (i.e., research) must occur during the entire course of its duration which may require the presence of an astrosociologist, and lessons learned must guide planning for the next project. The best approach involves planning the overall social structure and culture of the social environment ahead of the mission. This process involves the creation of smaller social structures within the overall *space society* such as institutions as well as smaller social groups and communities within the population. Study of the evolving culture requires monitoring in order to detect and hopefully correct problematic social patterns and belief systems that develop over time. This new exercise demands strong scrutiny and scientific rigor. And in the long-term course of events, Earthlings must prepare themselves to deal with ethnocentrism that will inevitably develop within the space society, including the establishment of values that may counter the expectations of those residing on the Earth. *Interplanetary relations* will develop and thus require early attention along with the core attempt to construct an Earth-friendly society. The attempt to control the space society from Earth should be abandoned as soon as possible for this reason as well as the long-term goal of moving steadily toward the construction of distant and isolated space societies (Pass, 2006a).

## A NEW PARADIGM

Is such a new paradigm that includes the social sciences really needed? This question implies that we should seriously begin to consider why astrosociology is relevant today and into the future. The automatic rejection of the social sciences as “non-scientific,” a stance taken by the space community as a whole in the past, represents a questionable position at best. The current practice involving ignorance of astrosociological issues requires examination, especially now that the field is developing in a formal manner.

Based on this discussion thus far and based on current practice, three related questions come to mind. Why does the space community need astrosociology at all? Why should an engineer or space scientist care about the social sciences when they have done fine without them (aside from psychology) since the beginning of the space age? Finally, why do members of the space community fail to see the value of all the social sciences in furthering their objectives? (Pass, 2005b).

Such questions undoubtedly come to mind when the construction of space societies receives serious consideration. The answers depend upon the ultimate nature of goals of human space travel and occupancy. If humanity remains content with “playing in its own backyard” (i.e., the Earth-Moon system) (Pass, 2006b), then a new paradigm makes little sense. Conversely, if humanity seeks to move out beyond its own backyard, we must develop this new paradigm so as to test out physical engineered systems *and* constructed social structures operating within the physical environment.

The new paradigm would require collaborative planning among space scientists and engineers to continue as usual except it would also involve collaboration with astrosociologists and other social scientists. Social and cultural issues, long regulated to evaluations of unscientific and thus low-priority status would need to be recognized as the increasingly significant issues they truly represent. The collaboration between the natural and social sciences on a substantial and formal basis represents the new dimension to the existing paradigm favored by NASA since its inception.

The new rules would require the settlers to solve their own everyday problems without direct input from mission control. The purpose of mission control would shift to monitoring settlement functions and communications *without* intervention unless an emergency presented itself. This would allow researchers in the population and those on the Earth to collect data analogous to an isolated social environment. A major assumption is that the *social* environment is just as important to the success of a settlement as the physical environment (Pass, 2006a). We must consider this idea as a linchpin for the new model created to characterize even the first lunar settlement. It should not matter whether the group consists of all professional astronauts or a combination of astronauts and others (e.g., scientists, contract workers, civilians of various backgrounds). The major consideration involves the construction of a physical and social environment combination in which the citizens of the new space society live and work without constant interference from the Earth.

A provision may be made for professional astronauts who control major physical systems to operate in constant communication with mission control, though this arrangement must be isolated from the rest of the settlers and studied as a separate component. The main component would consist of the main social system, perhaps led by a civilian government, that would operate without this constant interaction with Earth. This provision may become a necessary compromise to ensure an acceptable level of safety margin for early settlements. Such details will require discussion in early planning sessions.

The number of inhabitants sent to the first lunar settlement requires consideration. From an astrosociological point of view, the greater the number the better. Adding additional members adds to the complexity of the social environment and increases the chances of conflict to be sure. However, the greater level of complexity allows for the collection of data analogous to distant space societies which will require a large number of inhabitants to survive (Pass, 2006a).

## Utilization of Astrosociology

What does it mean to utilize astrosociology? It refers to (1) taking advantage of the rich sociological and social science knowledge that currently exists (even though it is currently nearly exclusively applicable to other areas of social life) and (2) conducting new research in the area of *astrosocial phenomena* (i.e., the social and cultural patterns related to outer space) to supplement the existing knowledge base. Astrosociology focuses upon aspects of social life that somehow relate to space, or the intersection between space and society. Many current terrestrial principles will undoubtedly find relevance in the context of astrosocial phenomena. For example, urban sociology may have much to offer when it comes to designing physical environments. Social and cultural considerations would enter the planning process rather than creating designs that favor engineering solutions. And, of course, the participation of psychologists, anthropologists, political scientists, historians, and other types of astrosociologists will provide a wide range of insights about how best to do things, insights largely silent for nearly all of the history of the space age.

Through the application of existing relevant knowledge and new specifically designed research efforts focusing upon the influences of astrosocial phenomena, the social sciences may be drawn together by uniting social scientists with a common interest in space. The social-scientific approach can be added to the common approach conducted within the space community (which generally lacks the collection and analysis of legitimate social science data). Astrosocial knowledge is missing and requires attention.

*Astrosocial knowledge* is defined...as all the information gained about astrosocial phenomena within the subjective cultural environment characterizing a particular society, including the influences of external cultures impinging upon that society from the outside. The concept of astrosocial knowledge constitutes a subset of social knowledge. Its separation represents an

important development as a focus of astrosociology and additionally as a neglected area of research common to all sciences previous to the creation of this new field. (Pass, 2006b).

This definition of astrosocial knowledge is meant to provide a more narrow focus. It also serves to place an uncommon emphasis on astrosocial phenomena rather than the common emphasis on engineering or space phenomena that astronomy and cosmology engender, for example.

Utilizing astrosociology both on the theoretical/research side and applied side will add a new robustness to current efforts now centering their attention on space settlements. The latter implementation, known as *applied astrosociology*, most directly involves using astrosocial knowledge to solve practical problems related with space missions:

...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, 2005a).

Applied astrosociology may provide solutions or partial solutions for terrestrial social problems as part of NASA's technology transfer/spinoff programs or from other sources. Beyond that, future missions should plan to adapt habitat technologies to terrestrial problems to strive for Wingo's (2004) longstanding goal:

The exploration and development of space, including a return to the Moon and on to Mars, must bring concrete benefit to the people of the United States and the world, to transcend the problems of today, and improve our lives for ourselves and our posterity (Wingo, 2004).

The betterment of all of humanity, wherever it resides, represents a noble ongoing objective.

## **Step-By-Step Process**

This new paradigm includes a common historical approach that dictates inclusion due to its successful implementation in the three prior programs that culminated in humanity's first landing on the Moon. The first Moon bases signify groundbreaking projects in engineering terms, of course. Sustaining a physical environment for human survival must receive great attention. Engineers should conduct research to learn lessons from early outposts and apply them to subsequent projects. In this way, engineers can implement improvements in new projects. This procedure is nothing new to the space community.

What *is* new to the space community involves implementation of this same step-by-step process to the construction and evaluation of the social environment, and, in fact, a livable space society capable of both physical survival *and* social and psychological survival. Once the inhabitants enter the Moon base and begin their lives in this new physical environment, they must begin to deal with one another. The social system must function reasonably well in order to make it livable and sustainable because physical survival fails to reflect anything about how the social system operates. Astrosociology is now being developed to fill the missing niche in space theory and research in an organized way that replaces the work done historically in small collaborative efforts or in relative isolation without the obvious accumulation of knowledge.

A most important consideration involves the mix of inhabitants based on a number of social dimensions. Perhaps the most important dimension is the occupational statuses of the individuals and how they impact on one another. A diverse mix of occupations is important in order to meet the social needs of the population (Pass, 2006a). Backgrounds should include professional astronauts, but also scientists, engineers and other statuses. As the population grows, more "mundane" occupations require incorporation (e.g., barbers, medical doctors, and shopkeepers). Space societies will require that we collect data regarding non-professionals. The population should be well diversified purposely, increasingly so as we add more individuals to the population.

One way to move forward in the implementation of this new paradigm could involve the building of a modular physical structure. A greater capacity may be added to the physical environment and the population over time. This approach would be helpful since the social system becomes much more complex as each new person joins the space society. The social environment inside the physical structure would be increased whenever the physical environment is increased. This type of planning before the construction of the physical structure serves as a good example of how astrosociologists and engineers can work together.

The physical structure must be conducive to the social environment. That is, the design of the physical habitat must encourage positive social interaction rather than social isolation of individuals. The layout of the physical elements will call for collaboration among psychologists along with astrosociologists of other backgrounds and space architects. Social equality should

be considered so that any influences of a social class structure may be minimized. That is, the privileges of those within the social system should exist at nearly identical levels. If not, planners must determine why not. This serves as another example of an astrosociological consideration that may not occur to a bureaucrat, space scientist, or engineer.

At some point, when it is deemed appropriate, family structures will be added to the population. If we are to mimic a space society located at a great distance from the Earth, it should probably occur fairly early in the implementation of the paradigm. Family sociologists could prove extremely valuable in planning for this contingency as can anthropologists and psychologists. This measure would eliminate the problem of family separation.

The issues discussed here represent a preliminary consideration of how this new paradigm may be formulated, the important issues to consider, and how best to implement it. No matter the details, however, the study of all the elements of the new space society should be built into planning from the very beginning in order to capture subtleties and avoid scrambling to understand unexpected outcomes within the population after something injurious occurs. The more quickly we can simulate a distant and isolated space society, the more quickly we can begin to collect the data needed to understand how to construct a real one in the future. By using a model based on a step-by-step, learn as you go, methodology, we can take advantage of the problems that occur as we go when the next project begins its preliminary planning process. Needless to say, the data and analyses should be shared by all nations who wish to undertake in this type of project and those who collaborate on a single project.

## CONCLUSIONS

The construction of livable societies in space will prove difficult to achieve. In part, a “livable” society in space refers to a social system in which the population lives in a social environment characterized by well-designed social institutions and other structures that regulate human behavior in ways deemed constructive by the members of a particular space society. The construction of a livable space society involves an operational social and cultural environment in which members of that society interact with one another on a productive basis. And while no amount of planning can guarantee that no social problems will occur, it can devise social institutions to formally cope with them as they arise.

In a sense, then, the term “livable space society” indicates a civilized society as opposed to one fraught with chaos and disorder. When humanity travels far from Earth, the rotation of crews to solve personnel issues becomes unworkable. The citizens will need to solve their own problems without outside assistance or the comfort of being able to return to the Earth. The members of a space society require structure to their lives and formal ways of dealing with their grievances, their fears, or any harm done to them. Citizens will require a sense of belonging as well as guidance and a sense of purpose. In other words, the space society (like all societies) will require the construction of a culture with all of its ramifications (see Pass, 2006a).

Many in the space community argue that we should bypass sending humans to the Moon and go directly to Mars. They argue that the Moon is uninteresting and devoid of life, and thus it represents a waste of time and money. Others, including the management of NASA who choose to follow President Bush’s *Vision for Space Exploration*, argue for going to the Moon first to learn how to live on another “planet” and then on to Mars utilizing the knowledge gained from living on the Moon. One example involves the fact that Moon dust and Mars dust will pose similar problems for colonists. Two other examples include coping with radiation and less gravity, both of which pose greater problems on the Moon than on Mars. If we can cope successfully with such problems on the Moon, Mars should pose less of a challenge. Beyond the engineering and architectural problems are the social problems that may develop. The strategy offered here allows for the study of both environments in a way that makes space societies move livable on both a physical and social basis.

A robust research strategy must determine the course of human expansion in terms of both distance and numbers sent. We cannot move outward very far until we meet both the physical and the social challenges with solutions that reliably sustain space societies independent of Earth influence. Consequently, it behooves us at this early stage in our development of space societies to conduct research and utilize its findings toward practical applications related to both the physical *and* social dimensions involved, and to apply learned lessons on an incremental basis as we proceed. Connors, Harrison and Atkins (2005) state the complex future well, including the error of continuing to overlook the social sciences, in the conclusion to their book:

In fact, no source could support the volume of research that is potentially important to extended spaceflight; the relevant issues are too diverse and the questions too many. Information must be gathered using whatever means are available...[W]e are now at the point that marks the end of our sojourn as visitors in space and the beginning of our role as space inhabitants. The thoughtful contributions from many disciplines can ease this passage.

Astrosociology, in both its theoretical and applied forms, seeks to assist in making contributions from the social sciences possible by organizing social scientists interested in space research and allowing them to collaborate with those traditionally part of the space community.

It remains vital to emphasize that our expansion into outer space must involve *both* space scientists and engineers *and* social scientists in a formal collaborative strategy in order to ensure our successful construction of space societies. Why is such a

collaborative approach valuable?

Consequently, a major focus on the social environment requires bringing sociology and the other social sciences into the mix in addition to developing astrosociology as a banner under which sociologists and all interested scientists can collaborate in an organized manner in order to build a coherent body of knowledge and related literature. Formal collaboration between astrosociologists and space scientists/engineers can serve to provide all those involved with a well-rounded understanding of all the issues involved with constructing a space society (Pass, 2006a).

Success cannot be guaranteed even with reliable equipment and a stable physical environment. Social and psychological problems can easily doom a space society without a stable social environment in which carefully constructed social structures regulate and guide human behavior in positive ways. Additionally, their culture must support isolation and hardship as virtues, at least in the beginning. The data to make livable space societies possible exist only fragmentarily, rooted in terrestrial social life, so research in the space environment itself will prove invaluable.

In fact, astrosociology now exists to meet the challenges best handled by social scientists in a strong cooperative manner with the traditional space community. Working together, space societies can eventually thrive farther and farther away from the Earth, successfully coping with both physical and social problems without the need (or desire) to interact with mission control personnel due to ethnocentric reasons and the impractical nature of doing so. We must start to consider these types of issues now before the first Moon base undergoes construction so we are properly prepared. If we consider each space society project as the next stage of an overall research agenda, then we can move forward in a step-by-step process that allows for advancement at the following step through the application of lessons learned.

The new paradigm proposed here moves us away from an Earth-based mission control model and toward an independent space society model. Achieving this independence in the relative safety of the Moon's surface must become a top priority, if not for the first base then for one subsequent to it at some point. Ultimately, "livable" refers to a survivable space society on both the physical and social dimensions, and achieving that requires a lot of work by a lot of diverse people. But we should strive for something more. In human terms, a "livable" space society refers to the combination of a *reliable* physical environment that meets biological needs and a *stable* social environment that allows for a properly functioning society. Mere survivability should not be the goal lest the inhabitants' quality of life fall below a level that allows for them to live happy and productive lives.

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