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Albert A. Harrison: Outer Space, The Human Dimension, and Astrosociology[1]

Jim Pass[2]
Astrosociology Research Institute (ARI), Huntington Beach, CA 92647

Dr. Albert A. Harrison's sudden and untimely death in February 2015 ended an extremely productive and influential career as a rare social scientist – specifically a social psychologist – who focused on space issues such as SETI, astrobiology, planetary defense, space-based folklore, behavioral health, the human elements associated with spaceflight, and space settlement. His formidable collection of work actually contributed to building a foundation for astrosociology, a field that was established toward the end of his career in 2004. He worked with other social scientists but also with those in the space community, including contributing to several NASA projects and publications. While Dr. Harrison's early work was not aimed at helping to legitimize astrosociology, it demonstrated that social science was relevant and undoubtedly indispensable to space exploration research. And indeed, it did have that effect once he began to support the development of the field approximately one year after this author introduced it. In fact, he became the first member of the Astrosociology Research Institute's Board of Advisors in 2005. Thus, his contributions not only supported the field of astrosociology, but they also provided social scientific insights to the space community and demonstrated the importance of space-based research to the social science community. His focus on the human dimension of outer space – that is, the importance of people, culture, and society – provides a legacy that must be recognized and presented to anyone interested in space education and research. His career-long focus on collaboration among all scientists, whether they focused on STEM subjects or human subjects, is perhaps Dr. Harrison's most important contribution. He also helped push for the multidisciplinary approach that astrosociology took on at an early stage. Therefore, this paper looks at Dr. Harrison's career as a model for what can be accomplished with collaboration between the two branches of science (i.e., the physical and natural sciences vs. the social sciences, humanities, and the arts), and it further projects how this approach can benefit space exploration and settlement in the future. Humans are involved with every aspect of the exploration of space, even when they sent landers, rovers, and probes to other cosmic bodies; and what they do affects societies and their citizens. In summary, the objective of this exercise focuses on demonstrating that (1) social scientists, humanists, and artists can contribute much to space research and education through an examination of Dr. Harrison's career and (2) we need to take better advantage of this fact.

I. Introduction

DR. Albert A. Harrison's legacy presents the space community with an extremely important lesson that requires careful attention: the value of the social sciences, humanities, and arts that encompass the "other branch of science" – apart from the overly emphasized STEM (non-social science, technology, engineering, and mathematics) fields and disciplines – cannot continue to receive scant attention if humanity is truly destined to migrate out into our solar system and beyond. Likewise, the introduction of STEAM, which adds the arts, is an important step forward, but it still fails to include the social sciences and humanities (Pass and Harrison, 2016). The very fact that humans are involved, which alludes to the tragically underemphazed human dimension brilliantly described in Dr.

[1] Some of this material was presented in rough form at the 2016 Contact Conference, though no paper was written. For details about the conference, go to http://www.contact-conference.org/.

[2] Chief Executive Officer and Executive Editor of The Journal of Astrosociology, P.O. Box 1129, Huntington Beach, CA 92647, and AIAA Member of good standing.

Harrison's book in 2001, should, on face value alone, indicate the importance of the need to involve social scientists and humanists. Instead, the "other branch" of science has received relatively little attention or funding. Harrison, (2001:23) speculated why NASA viewed the social sciences with suspicion during the 1990s.

> Why might NASA be reluctant to address issues that could be critical for mission success? Perhaps mission planners and managers simply are not aware of human factors or of their importance. Perhaps the "hard" scientists who control the program and who are used to accurate quantitative results find the "soft" sciences (such as anthropology and psychology) fuzzy, imprecise, and somewhat untrustworthy. No amount of argument can obscure the fact that the physical (and, to a lesser extent, biological) sciences seem able to prove "right answers" to questions while anthropologists, psychologists, and sociologists hedge their bets.

The roots of whatever historical forces downplayed the social and behavioral sciences as important to mission planning continues to this day despite the fact that social scientists, humanists, and artists have made important contributions throughout the course of the space age and into the so-called "NewSpace" age, most commonly outside of official channels. Unfortunately, their numbers have remained uncomfortably much too small.

Rocket science and all the STEM-related disciplines are necessary for spacefarers to survive their interactions with the various space environments they will encounter, but they are not sufficient to ensure that they can survive their interactions with other human beings in these harsh environments. Dr. Harrison (see Appendix B) addressed issues involving humans living in harsh environments long before astrosociology (Harrison and Connors, 1984; Connors et al., 1985; Harrison et al., 1991). A major tenet of astrosociology revolves around collaboration among social scientists, humanists, and the artists. However, it also encourages fostering collaboration between the two branches of science, the other branch of which includes the natural and physical sciences as well as engineering and mathematics. Regrettably, STEM has never really included the social or behavioral sciences in its "S" designation.

On a personal note, this paper has evolved into a personal account of how Dr. Harrison became involved with astrosociology, including – importantly – how he also became a friend in the process. His support and contributions to the field since 2005 and the Astrosociology Research Institute (ARI) since 2008, including his few collaborative efforts with me, helped to provide legitimacy and enabled us to attract supporters over the years. Therefore, this paper uses the first-person voice as well as the third-person voice, which is unusual for me, but necessary in order to present this historical account from my own perspective.

Moreover, this paper addresses Dr. Harrison's legacy through the words of others whom I solicited to send me comments regarding his impact on space education and research. I also utilize his own quotations to make important points regarding his advocacy for (1) supporting astrosociology, (2) getting the social sciences more strongly involved in the study of space issues, and (3) increasing the level of collaboration between the two branches of science. Finally, my own commentary regarding his legacy is also included throughout this paper.

Those unfamiliar with Albert A. Harrison and the prolific scholarship he has left behind ought to become acquainted with it, as scientists and scholars working on space issues in both branches of science will certainly benefit personally as well as professionally. The foundation for astrosociology to which he contributed involves a focus on the human dimension. And, after all, are humans not conducting space exploration and related activities? Moreover, his work touched on the human condition in the context of outer space, and thus it is relevant to all of us.

II. A Foundation for Astrosociology

I founded the academic field of astrosociology in 2004 with the uploading of a new website called *Astrosociology.com*. The current working definition of *astrosociology*, subject to evolution, is the study of *astrosocial phenomena* (i.e., social, cultural, and behavioral patterns related to outer space) (Pass, 2009). It focuses on the relationship between space and society. Space issues are looked at from a human dimension perspective. Humans explore space, whether by going out there themselves or remotely via orbiters, landers, rovers, or other technological tools. These forms of material culture are part of societies. This means that now, and into the future, space affects those beyond Earth's atmosphere, of course, but also those who live within it. Thus, those who explore space for a living are affected, obviously, but so are those who do not work in the aerospace or space community – including those who view space as a waste of time and resources, and would rather spend the money fixing potholes.

Astrosociology quickly became a multidisciplinary field that favored interdisciplinary practice, partly due to the influence of Dr. Harrison, but also based on inquiries from other interested persons from disciplines other than mine (i.e., sociology). Today, contributors to astrosociology include those from the social sciences and behavioral sciences, the humanities, and the arts, as well as those with STEM backgrounds. There was a gap in knowledge prior to 2004, so astrosociology was established to create a body of knowledge and a coherent, recognizable literature.

It is important to recognize that space activities strongly impact nations around the world, including increasingly significant impacts on different sectors of their economies. The Space Foundation's publication, *The Space Report*

2016: The Authoritative Guide to Global Space Activity, reported that the global space economy totaled $232 billion worldwide.[3] Perhaps more importantly, space also affects citizens of various nations in both spiritual as well as practical ways, to be discussed throughout this paper. The concept of the human dimension hints at the idea that space affects human beings even without their knowledge because its effects are pervasive (that is, common in society) and omnipresent (defined here as even more fundamentally ingrained in social structures).

I was all alone when this started with my upload of the website, and the project had no reason to succeed. In fact, other attempts had failed, such as exosociology, which received little support toward the end of the twentieth century. There were no supporters initially. For a short while, there seemed to be more detractors than supporters. The period between 2004 and 2008 was tenuous in many ways. Unfortunately, most social scientists still view space as unimportant. This reality was so obvious to me that I wrote about space as "sociology's forsaken frontier" during the very first year (Pass, 2004c). Social scientists look down at the ground, worrying about traditional concerns such as deviance and inequality on a terrestrial stage, even though such issues pertain to space as well. Overall, they fail to look up with a curious heart, unable to build the bridge between their Earthly apprehensions and the heavenly impacts on their lives. They lack an adequate sense of the astrosociological imagination, to be discussed shortly.

Nevertheless, I persevered and slowly attracted supporters who, like myself, viewed the near absence of social scientists and humanists as a negative status quo regarding the future of space exploration and settlement. It started with my own discipline of sociology, but it soon became clear that other disciplines were also underrepresented, which resulted in a strong effort to collaborate with others beyond my own discipline. Dr. Harrison was a strong advocate of collaboration early on, which strongly influenced me and helped to provide legitimacy to the movement when we made the decision to shift to a multidisciplinary approach in late 2004 or early 2005.

> Spaceflight-analogous environments may be closer to spaceflight environments than the everyday environments familiar to you and me, but they are not identical. At this point in history, understanding the human side of spaceflight requires some guesswork, as well as painstaking assembly of information from many different sources (Harrison, 2001:37).

Supporters from other disciplines started to inquire about astrosociology due to the invitation to others from multiple disciplines to join us. By 2008, the establishment of the Astrosociology Research Institute (ARI) became a reality.

Thus, one early supporter, who turned out to be a godsend to the development of astrosociology was Albert A. Harrison. Although he was well established as a rare social scientist with strong ties to the traditional space community that still remains overly comprised of physical and natural scientists and scholars, Dr. Harrison became enthusiastic about the prospect of bringing more "soft" scientists into the traditional fold. He especially favored the multidisciplinary aspect of astrosociology that he encouraged from the beginning as well as the prospect of creating a formal collaborative bridge between the two branches of science; that is, between the "hard" sciences and what social scientists often refer to as the "harder" scientists (Harrison, 1997) – meaning that the social and behavioral sciences along with the humanities are arguably are more difficult due to the unpredictability of human beings. The importance of recognizing and taking advantage of convergences among fields and disciplines represents an important skill for all scientists involved in space education and research (Pass and Harrison, 2016).

III. The Astrosociological Imagination

A significant problem exists and has remained the status quo throughout the space age. Space issues, it is quite clear, do not fall within the purview of the social sciences and humanities, at least among the mainstream members of these disciplines and especially, it seems, among those in power. Otherwise, the need for astrosociology in the twenty-first century would not be required because something like it would have existed long before 2004 when I proposed it and began its initial development.[4] Most social scientists and humanists lack the insight as to how important space exploration really is, despite obvious telltale signs such as the various uses of satellites that affect our everyday lives, spinoffs and technology transfers that contribute to improve living conditions among those living in both "developing" and "developed" countries, and efforts to protect the planet from asteroids and comets that could end humanity's very existence, among other significant and rather obvious clues.

Most social scientists and humanists lack what this author has defined as the "astrosociological imagination." It is borrowed from sociology's concept of the "sociological imagination" that was introduced by sociologist C. Wright Mills (1959) to describe the connections between personal experience and larger society. The average person

[3] A summary of this report by the Space Foundation is available online: http://www.spacefoundation.org/media/press-releases/space-foundation-report-reveals-global-space-economy-323-billion-2015.

[4] I must acknowledge Marilyn Dudley-Flores and Thomas Gangale at this point. They joined me soon after I founded astrosociology in 2004. They also became ARI's first officers with me for a brief time. They were very helpful in getting astrosociology moving in the right direction between 2004 and 2008, and added to its legitimacy.

tends to understand social reality from what he or she experiences, what becomes familiar, over the course of social interaction on a small interpersonal scale. This is less problematic with the advent of social media and worldwide television news perhaps, but the concept still holds quite well. Additionally, the sociological imagination allows a person to understand a given phenomenon or behavior from a variety of different perspectives. Two examples are provided below regarding space exploration in the context of the astrosociological imagination, which, of course, focuses on the human dimension of space exploration and related issues, as Dr. Harrison often indicated.

The *astrosociological imagination* is a high-level conceptualization; it is an insightful way at looking at the world that allows a person possessing and exercising it to make connections between his or her personal world of experiences and the macro-level (larger scale) existence of astrosocial forces. These individuals possess the ability to separate personal biography from larger world events – in this case, astrosocial phenomena – and understand their interconnections. This ability to separate the two indicates that they are aware of forces beyond their personal lives, including hidden phenomena and meanings. Possessing the astrosociological imagination means that the individual knows that he or she does not live in isolation on a personal or even regional scale. Rather, these individuals realize that they are influenced by a larger set of space-related forces that affect them and everyone else. This ability is important because many of these astrosocial phenomena are often "invisible," even to those who possess the astrosociological imagination if they fail to exercise it in a given situation.

Unlike most social scientists, Dr. Harrison possessed a strong sense of the astrosociological imagination, long before I wrote about it (see Pass et al., 2010, for example). The fact that he conducted space-related research for over thirty years – often in isolation from his psychology colleagues and peers, or became involved in interdisciplinary exercises within the traditional space community such as with those working for NASA or the SETI Institute, as examples – demonstrates that he was strongly committed to exploring the connections between events in his own personal life and the larger influences of astrosocial phenomena. He did not know anything about astrosociology for most of his career, but he still studied space topics involving issues that today comprise astrosociological research. Dr. Harrison's work represents a significant part of the foundation of astrosociology, which was made possible because he possessed a very strong sense of the astrosociological imagination.

The superficial reality of events that we all recognize in our daily lives possess hidden meanings under the surface that are not apparent or recognizable to most of us. Possessing the astrosociological imagination means that a person can see alternative explanations that go beyond what they normally would understand regarding obvious observable items on the surface. They do so by utilizing the ability to see how more hidden or obscure aspects of social reality affect their lives beyond a simplistic level. A couple of brief examples illustrate this point quite nicely.

The space race during the Cold War between the United States and Soviet Union on the surface appears to be just that, a race to see who can land a spacecraft on the Moon and return the spacefarers back to Earth in good health. Looking more closely at the situation, one can see that the race to the Moon was an extension of an even more serious set of circumstances than simply improving science and technology or achieving a new feat. The military was involved due to Cold War tensions apart from NASA's Apollo program. Space represents the ultimate high ground, so military leaders were interested.

> The US. military also argued for a human capability to fly in space for rapid deployment of troops to hot spots anywhere around the Earth, but they never managed to convince the political leadership of the nation and, despite periodic attempts, never gained a human military mission. The human spaceflight enterprise also gained energy from Cold War rivalries in the 1950s and 1960s as international prestige, translated into American support from nonaligned nations, found an important place in the space policy agenda (Launius, 2006:54).

Moreover, each nation sought to prove that its political system and way of life was superior to the other. It was not simply a space race, but a symptom of a far more complex social, political, military, and economic climate. Many underlying currents played important roles in making the landing on the Moon possible, or even desirable. They involved underlying military, cultural, and sociopolitical forces.

Likewise, the uses of satellites in modern life are taken for granted by those who lack the astrosociological imagination. They use their cell phones for making calls and receiving driving instructions. They receive weather reports on TV and the radio. They watch television programs on multiple devices and in remote locations. The average person takes advantage of such capabilities often without thinking too deeply about what makes all of it possible. Even if they have a simplistic understanding regarding how satellites affect their daily lives, it tends to be at a superficial level that misses most of the influences of astrosocial phenomena. The impact of science and technology is much more complicated than most realize. In addition, other capabilities exist about which they remain unaware, such as the military uses of satellites and the more obscure features that exist.

Possessing the astrosociological imagination indicates that a person understands space issues more inclusively. He or she sees connections among astrosocial phenomena, and between astrosocial phenomena and non-astrosocial phenomena, that the average person fails to recognize. In contrast, Dr. Harrison's long and distinguished career

covered a great many topics and he understood the social change they produced because he perceived the underlying realities and their interactive connections with one another. The astrosociological imagination is an ability that one must practice to acquire and exercise on an ongoing basis to retain. It does not come to one very easily.

IV. Albert Harrison's Support for Astrosociology and ARI

Despite the fact that history was against me in terms of my likelihood to succeed, I decided to pursue astrosociology. Initially, I did not know anyone who worked on space issues personally, but I read Dr. Harrison's book called *Spacefaring: The Human Dimension* (Harrison, 2001), and later *Living Aloft: Human Requirements for Extended Spaceflight* (Connors et al., 1985) and *After Contact* (Harrison, 1997). I also became familiar with the NASA publication he co-authored called *Workshop on the Societal Implications of Astrobiology: Final Report*. (Harrison and Connell, 1991). I thought they were all excellent, which they are, of course, but I was surprised that even with this initial small sample size, I realized that they covered many of the areas that I had envisioned for the purview of astrosociology. In retrospect, perhaps it is not all that surprising that Dr. Harrison decided to support astrosociology because he had already written about "astrosociological" issues long before 2004.

A. The Period Before ARI

Looking back, I was naïve in the sense that there was a very small likelihood that he would respond to any of my inquiries. Nevertheless, I contacted Dr. Albert A. Harrison via email and explained what I wanted to do, and to my surprise, he responded! It was not an immediate response, but he did respond. Not just with a kind "interesting" and "good luck," either. He actually provided enthusiastically supportive words! More than that, he stated that he wanted to participate in my venture. As indicated by Dr. Bishop in the next section, Dr. Harrison decided to join the movement after consulting with others about supporting astrosociology during an early climate that seemed permeated with negativity against it. This accounted for the hesitation in responding back to me.

It was incredible that this first astrosociology session called "Astrosociology: The Sociology of Outer Space," which took place in 2005 – approximately only one year after I founded the field – at the California Sociological Association (CSA) conference in Sacramento included Dr. Al Harrison from the UC, Davis psychology department and Dr. Douglas Vakoch of the SETI Institute as presenters. This was the first time I met Drs. Harrison and Vakoch. They accepted invitations from an unknown sociologist who founded an unknown field working for an unknown organization called *Astrosociology.com*! There was no track record for this author and ARI did not exist at that point. Furthermore, some internet-based commentary was initially negative. It seemed like a miracle of sorts at the time, and looking back at it, it still seems like a miracle. The session went well, even though it was a sociology conference, which was attended mostly by students who were not accustomed to listening to talks about space issues. Such issues were too often regarded as irrelevant to social life; seemingly unrelated to the daily concerns of citizens who happened to live on Earth (Pass, 2004c). The talks seemed to inspire these students to some degree.

As Dr. Sheryl Bishop relates and is also included in Dr. Harrison's full quotation about this subject below, he was well aware of the difficulties to expect as the development of astrosociology continued, as he had experienced it before during his important role in the development of SETI (the Search for Extraterrestrial Intelligence) and astrobiology, which involved the "giggle factor" among many detractors. Nevertheless, he was willing to endure it once again and put his reputation on the line for a then unknown field. Except for this author and a few others, Albert Harrison had little idea about the leaders of this movement. It represented a giant leap of faith for him.

B. The Period Following the Establishment of ARI

Dr. Harrison became an advisor to ARI in 2008, soon after ARI was established. He was the first to join our Advisory Board, which was a true indication of his strong level of support for a fledgling nonprofit organization in its infancy. He became an even greater source of boundless support and vital contributor following the establishment of ARI in a variety of ways. One of these was his participation in a second meeting for which he agreed to travel from Davis, California to Alabama and pay for all of his own expenses.

1. The First Annual Astrosociology Symposium

Dr. Harrison attended our first astrosociology symposium, which turned out to be a series of three meetings starting in 2009 before the parent conference called the Space Propulsion, and Energy Sciences International Forum (SPESIF) folded. The three annual meetings proved to be an effective way to reach a greater number of people, including physical and natural space scientists who later became supporters. The first astrosociology symposium, attended by Dr. Harrison, took place in Huntsville, Alabama near NASA's Marshall Space Flight Center.

Albert Harrison contributed to the discussions throughout the symposium as presenters discussed a wide variety of topics related to astrosociology. He was enthusiastic and demonstrated his knowledge regarding these wide-

ranging issues, which made this first symposium special and contributed to its success. My paper discussed the state of astrosociology using a metaphor I labeled as the "astrosociological frontier," which I defined as the following.

> The *astrosociological frontier* refers to the lack of development of astrosociology as a scientific field – or anything like it earlier during the space age. It includes both the 1) unoccupied "landscape" in academia characterized by the lack of astrosociology in its curricula and 2) dearth of space research focused on social-scientific (i.e., astrosociological) topics both inside and outside of traditional academia in collaboration with traditional space community members and the new space entrepreneurs. Within academia, the "frontier" is characterized by a lack of courses, programs, and departments dedicated to astrosociology. In the future, proponents of this new field expect the astrosociological frontier to become characterized by a growing number of "settlements" in curricula across the country and world. As things stand, however, the early "astrosociological pioneers" include those who seek to explore these underappreciated issues within academic and professional climates that discourage them from pursuing their interests (Pass, 2009:375).

He was a pioneer on the astrosociological frontier long before I defined and discussed it. His early writings and participatory efforts especially helped greatly to pave the way for the possibility of astrosociology's success. He always smiled when I joked with him that he was conducting astrosociology without realizing it long before I contacted him. He was truly one of the social science pioneers in several areas of space education and research.

C. Dr. Harrison's Many Documented Contributions to the Development of Astrosociology

This subsection includes extensive quotations by Dr. Harrison that demonstrate his support for astrosociology. A vital purpose here is to show how, while his work before 2005 served as providing a strong foundation for the field moving forward, his subsequent work built upon that foundation in ways that specifically address astrosociology as a viable and necessary field for the future. It started with that first conference paper in 2005. It is important to keep in mind that the concept of "the human dimension" underlies all of his work even when it is not specifically stated. Dr. Harrison spent his career injecting the human element in areas that traditionally favored hard science, technology, mathematics and engineering. His approach always sought to promote the social sciences while simultaneously seeking to collaborate with those who traditionally rejected individuals with his background. These efforts contributed to constructing the foundation for astrosociology long before it was proposed by this author.

1. First Astrosociology Paper (2005): "Overcoming the Image of Little Green Men: Astrosociology and SETI"

As mentioned earlier, my first invitation to Albert Harrison occurred early in the development of astrosociology. This was his understanding of the definition of the field generally and in the context of astrobiology and SETI: "Astrosociology deals with the broad, societal contexts of activity pertaining to space, as well as actual space exploration including human space exploration and the search for extraterrestrial life" (Harrison, 2005:14). This paper was written before I developed the current working definition, which was not put into writing until much later (see Pass, 2009).

At that time, he was well aware of the difficulties ahead, as mentioned several times throughout this paper. Here, he spells them out quite clearly.

> As an emerging research field, astrosociology, especially in the area of SETI, will lack many of the mechanisms that support established fields (Harrison, Billingham et al, 2000). Disciplinary biases that define some areas as "hot" are likely to discourage some sociologists from entering the field. Be prepared for "the giggle factor." Unless they carefully explain their work, sociologists whose activities can be linked to "little green men" risk ridicule and professional censure. For all intents and purposes, you will have no peer group. Although much has been published on life on other worlds, very little of this has been published by professional sociologists and their allies. Thus, expect a spotty and tangential literature base. Perhaps needless to say, there is little or no opportunity for funding (Harrison, 2005:14-15).

These troublesome realities did not make him waiver once he decided to support me at a time in which I had only posted the two parts of my Inaugural Essay that sought to define the field and argue for its significance (Pass, 2004a; 2004b). It was not much to go on at such an early stage, but he never backed down from the challenges that he knew lay ahead.

2. Spacefaring Society Conference Paper

In 2007, based on a conversation we had in 2005 at the California Sociological Association meeting discussed earlier, Dr. Harrison and I co-authored a paper that focused on the transformation of space-capable nations into spacefaring societies. This was the first time we collaborated on a project together. Though it was written by both of us, Albert Harrison was quite adamant about the potential of astrosociology. Moreover, he always insisted that my name should go first on all of our collaborative projects to benefit my career, which demonstrated his gracious nature. (See Figure 2 in Appendix C for another example).

> Astrosociology will likely become an increasingly important multidisciplinary field if only due to the probability that societies are indeed transforming their social and cultural structures in new ways that reflect spacefaring characteristics. Even the average citizen will need to understand the social and cultural changes taking place. Astrosociology will attract students from a variety of natural and social/behavioral disciplines to study the connections between space and society as these changes occur (Pass and Harrison, 2007:5).

This area of research from this perspective was new, and Dr. Harrison was quite interested in pursuing it further.

Dr. Harrison was quite convinced that astrosociological education and research would prove valuable in the future as societies experienced social and cultural change into the future. Space-capable nations especially continue to add mileposts moving them slowly toward spacefaring futures.

> Astrosociological research will prove necessary to determine the nature of these types of new patterns and track them against the mileposts and characteristics of the ideal type of spacefaring society over time. At any time, any particular society may shift into a spurt of exceptional growth of *astrosocial phenomena* (i.e., social and cultural patterns related to space), just as it may enter a period of stagnation or reversal. We need to remain cognizant of such changes, as societies benefit when they can recognize and manage (as best they can) potentially positive trends (Pass and Harrison, 2007:9).

While movement toward a spacefaring society was likely to be fraught with starts, stops, and possible reversals along the theoretical continuum, we both believed that societies could take advantage of the increasing effects of astrosocial phenomena in terms of reshaping their space and other types of policies.

This author is currently working on a co-authored chapter for an upcoming ARI book in which Dr. Harrison completed his parts before his untimely death. The chapter is tentatively called "Shifting from Space-Capable to Spacefaring Societies: Movement Along the Spacefaring Continuum toward a Theoretical Ideal Type" (Pass and Harrison, forthcoming). It will provide an expansion of the ideas in Pass and Harrison (2007) and (Pass 2011), focusing on the impact of astrosocial phenomena in societies on Earth into the future.

3. Article in Special Edition on Astrosociology in "Astropolitics" Journal

In 2011, our then ARI officer – Chris Hearsey, who now serves in the capacity of our Chair of the Board among other duties – served as the guest editor for our special issue dedicated to astrosociology. As was usually the case, Dr. Harrison readily agree to contribute to this volume. He mentioned to me that he viewed this special issue as another major step forward for securing the legitimacy of astrosociology. The article is called "The Search for Extraterrestrial Intelligence: Astrosociology and Cultural Aspects." This is one of his strongest sources of documented support for astrosociology in terms of the number of positive comments in one publication.

The focus of this article was the search for extraterrestrial intelligence that touched on issues related to SETI and astrobiology, both of which he agreed falls within the purview of astrosociology (Harrison, 2011). One of the sentiments he shared with me many times before is the notion that "[t]he current challenge for astrosociology in not gaining entrée to SETI, rather, it is one of increasing the interest of more social and behavioral scientists in the search and its potential effects" (Harrison, 2011:63). The same applies to all of the subfields of astrosociology as well. Sociologists are notoriously absent from conducting research regarding astrosocial phenomena (Pass, 2004c), though the other social sciences and humanities are not much better in this regard.

Relatedly, the social scientists who do conduct research considered astrosociological in nature often do so in isolation. "All too often, scholars who explore different astrosociological topics seemed unaware of each other's efforts, especially on the part of colleagues from other disciplines" (Harrison, 2011:64). This problem is something each of us has sought to remedy and it remains a problem that those of us at ARI must continue to address.

Albert Harrison had high hopes for the development of astrosociology, recognizing the potential of its various subfields covering issues that complemented work in the physical and natural sciences.

> Astrosociology is a scientific effort that includes research, theory, and application, and has intellectual links to the physical and biological sciences (when they address topics related to outer space), and to law, policy, and the humanities. Astrosociology has a strong educational component, which includes offering courses to support the interests of undergraduate social science and humanities students, and preparing a cadre of professionals to better address current and future astrosociological issues (Harrison, 2011 :63-64).

He saw this potential in astrosociology even though the research component of the field remains ahead of instituting the educational component even today.

Again, Dr. Harrison emphasized the complementary nature of the two branches of science, a theme that I and others have also emphasized.

> Today, there are many parallels between astrosociology and astrobiology. A primary goal of astrosociology is to bridge the gap between the physical scientists who develop new technology and generate new knowledge about outer space, and the social and behavioral scientists who seek to forecast, understand, and moderate the effects of space age technologies and discoveries on human beings (Harrison, 2011:64).

Here, Dr. Harrison again expresses his belief in the potential and significance of astrosociology regarding reactions to the discovery of intelligent life elsewhere in the universe, or even in our own solar system. He clearly recognized that various groups and institutions would react differently in different societies.

> There is endless opportunity here for astrosociologists, including likely reactions in non-western societies, particularly those where cultural traditions emphasize 'magic and myth' over science…[Also, see Harrison (2007)]. [In western societies,] [a]strosociology can also help us understand how various agencies and organizations (alone and in combination) are likely to react to the discovery (Harrison, 2011:74).

Such a discovery would undoubtedly affect various societal institutions such as the government, the economy, and religion, and would do so in a variety of ways based on the different cultures involved (Harrison, 2011).

Finally, on a more philosophical note, Dr. Harrison notes the contributions that astrosociologists can make regarding addressing the major questions regarding humanity's very existence.

> Astrosociology can help guide humanity into a future where scientific findings will play a greater role in discussions of great existential questions. Where did we come from? Are we alone? What is the future on Earth and beyond? SETI is a showcase for interdisciplinary collaboration (Harrison, 2011:80).

He places astrosociology in an important position within the cultures of societies. While all such questions may not ultimately have precise answers, Dr. Harrison argued that astrosociology can provide a framework in which social science can offer good probabilities for such seemingly unanswerable questions and can later place them in context should they become answerable by the 'hard' scientists. In any case, the social-scientific – or human – dimension of outer space is a vital perspective since humans are the ultimate subjects in the experiment we call social reality.

4. *Article in the First Issue of the 'Journal of Astrosociology'*

Once again, Albert Harrison was eager to contribute to the next opportunity, the first volume of the Journal of Astrosociology, when asked. He wrote an article called "Astrobiology: Where Science Meets Humanistic Inquiry."

> As such, astrobiology provides fertile grounds for astrosociology, the interdisciplinary and multidisciplinary study of social, cultural, and behavioral patterns related to outer space…The primary purpose of this paper is to explore the interactive and synergistic relationship between astrosociology and astrobiology…Astrosociology encourages interdisciplinary and multidisciplinary research on space exploration and settlement, searches for extraterrestrial life, defending Earth from space-borne threats, and other topics at the juncture of space, life, and humankind (Harrison, 2015:11).

This is another strong reference to the potential of astrosociology to become an important force in the study and understanding of space issues alongside the natural and physical sciences, including STEM and STEAM efforts within the space community.

5. Co-Authored Book Chapter: "Astrosociology (Social Science of Space Exploration)"

This was a chapter for a book on the topic of convergences in science and technology. Interestingly, our original title for the chapter was "Astrosociology: Outer Space, the Convergence of the Social Sciences, and Beyond." However, the editors decided to change it. Most sadly, this was the last publication we worked on that already has been published. It was finally published the year following this death.

> Discussions concerning science and technology convergence too often ignore the social sciences. This is not the case here, as the focus is on a relatively newly emerging and increasingly relevant social science field. Astrosociology is an interdisciplinary and multidisciplinary field that promotes and represents convergence of the physical/natural sciences and the social/behavioral sciences on all matters pertaining to humanity's interests and activities in space and the consequences of these activities for people on Earth (Pass and Harrison, 2016:545).

The opening line of the abstract above presents the existing problem and the rest of the chapter discusses how astrosociology exists to remedy this problem over time. Albert Harrison proposed the idea that astrosociology promotes convergences among all sciences from both within and between the two branches of science among those in disciplines and fields working on space issues.

> While political science and economics have sustained a strong interest in space, interest on the part of anthropology, sociology, and several fields of psychology has been low. Also, with the exception of selected space science research areas including astrobiology, the search for extraterrestrial intelligence, and the protection of the Earth from asteroids and comets, the receptivity of physical and natural scientists to inputs from the social and behavioral sciences has been low (Pass and Harrison, 2016:545).

We provided a short history of the various major social science and humanities disciplines and fields, as not all of them had the exact same track records. The common theme is that they all neglected space when looking at them as a whole. In other words, the number of social science pioneers such as Dr. Harrison was low in the overall scheme of things. The value that Albert Harrison added to this chapter, which was common, was his extensive knowledge of the literature in a great variety of areas.

> Increasing synergy between the "hard" and "soft" sciences requires increasing interest within both the social and behavioral sciences and encouraging receptivity on the part of physical sciences. This chapter emphasizes the need for convergence, the barriers to convergence, and potential approaches to reduce these barriers. Achievement of unprecedented levels of collaborative synergy is possible with increased levels of sustained convergences. This is possible by increasing social science literacy among the public and "hard scientists" and developing win-win research projects that accommodate varied interests and goals. SETI, astrobiology, and planetary defense serve as specific examples of successful convergence efforts, though they involve social scientists in relatively small numbers. These examples demonstrate both the limited successes and the largely untapped potential of the social sciences to contribute to space education and research (Pass and Harrison, 2016:545).

We decided to focus on three of Dr. Harrison's main areas of scholarship, which powerfully allowed us to present examples of how convergences could produce collaborative synergies that could definitely drive space exploration

to new unprecedented realities. Working with him on this project once again reminded me of his brilliance regarding what he did for over thirty years. This extensive reference section and Appendix A demonstrates this.

Dr. Harrison's belief in bringing every field and discipline together to work on space exploration and related activities is captured in the following sentence. "Astrosociology represents an effort to (1) increase interest among social scientists, (2) boost receptivity to social science inputs on the part of physical (and natural) scientists, and (3) thereby expand the level of synergy produced by all the many participants in the ongoing drama of humankind's entry into space working together" (Pass and Harrison, 2016:546). Furthermore, he was adamant about the influence of astrosocial phenomena. "Once again, it must become clear to all that astrosocial phenomena affect human beings, their societies, and their cultures, wherever they may be, even within the confines of the Earth's atmosphere and magnetic field (Pass and Harrison, 2016:554). When we wrote this sentence, he insisted on making it a strong statement. (Regarding the impact of astrosocial phenomena on Earth, see also, Pass and Harrison, 2007, which again, discusses space-capable and spacefaring societies). The goal is to disseminate the knowledge about how to acquire the astrosociological imagination among scientists and members of the public so as to put space in its proper context. More scientists would collaborate and more students would pursue space-related fields and disciplines.

D. My Acknowledgements to Albert A. Harrison

When I heard of Dr. Harrison's passing, I was surprised and saddened, naturally. My knee-jerk reaction was to point out his impressive legacy in the acknowledgment sections of various papers, articles, and chapters I happened to be working on, mostly during 2015. Here are three examples that epitomize my sentiments regarding Albert Harrison's impact on me personally as well as on the space and astrosociological communities.

My comments below are reflected by those of others discussed in the next section. This excerpt is from ARI's newsletter called *Astrosociological Insights*.

> This issue is dedicated to the memory of Albert A. Harrison who, most sadly, died early last month, in February 2015... He was a good friend, collaborator, and prolific contributor to space scholarship. On the personal side, he demonstrated to me what a caring friend could be like, calling me periodically to ask how things were going and to describe his many vacation experiences. Professionally, Al served as a model for how a consummate scientist should behave through his honesty, dedication to his work, and his willingness to assist others… Anyone interested in space education and research from a social science perspective should read his seminal work, ***Spacefaring: The Human Dimension*** [emphasis added] [Harrison, 2001], which was published in 2001. Of course, his numerous other books, articles, and conference papers represent a body of work that requires familiarization as well for any budding astrosociologist. (Pass, 2015a:1).

I ended my dedication to Dr. Harrison in the first issue of the *Journal of Astrosociology* by emphasizing the fact that he unconditionally aided us in putting ARI on the correct path regarding the development of astrosociology.

> While he can no longer advise us on future decisions, his influence has helped us develop our own roadmap that has greatly assisted us to pave the way toward accomplishing the various elements that make up ARI's mission to develop astrosociology as an academic field. Our newsletter and this journal reflect integral components in this effort. We greatly miss him, but we are very glad that we knew him, and we definitely plan to make sure that we build on his seminal foundational work (Pass, 2015b:8).

As a final example, I dedicated my 2015 AIAA Space Conference and Exposition paper titled "Astrosociology and the Planning of Space Ecosystems" to Dr. Harrison and his legacy. Once again, I mentioned his contribution to astrosociology's development, which touched on some of his most productive areas of scholarship.

> This author dedicates this paper to Albert A. Harrison for his friendship, encouragement, and collaboration over the past several years, before he passed away much too early in February 2015. His encouragement to develop astrosociology helped to make its successful development possible. His legacy associated with advocating a strong focus on the human dimension of spaceflight, astrobiology and SETI, planetary defense, space exploration, and space settlement leaves us with a substantial body of work that makes us all the richer for it (Pass, 2015c:9).

This particular dedication also emphasizes Dr. Harrison's invaluable work that he left behind for all of us interested in space issues from a social-scientific perspective to appreciate and utilize going forward. Some people will read his works for the first time while others should revisit them, as doing so will be undoubtedly beneficial to all those interested in pursuing astrosociology and/or developing their astrosociological imaginations.

E. Albert A. Harrison Tribute Page at *Astrosociology.org*

A page at *Astrosociology.org* is dedicated to Dr. Harrison and his amazing legacy. It features his publications and conference papers, a few of which we co-authored.[5] This tribute mentions his importance to space education and

[5] The page dedicated to Dr. Albert A. Harrison encourages students to read his works, which are listed. The page is titled: "In Memoriam • Albert A. Harrison • 1940 – 2015." Here is the link: http://www.astrosociology.org/AAH-InMemoriam.html.

research, especially in the sense that he continually demonstrated that the "other" branch of science had much to offer to the space community and society. His work proved that the efforts of social scientists and humanists were additive rather than inconsequential to what the "hard" scientists were doing. The dedication page also lists many of his writings and encourages students of all ages who are interested in astrosociology to become familiar with them.

Anyone interested in astrosociology should seek to expand their reading list to include Dr. Harrison's writings. The references of this paper and the unreferenced ones in Appendix A found at the end of this paper, which are replicated from the tribute page at *Astrosociology.org*, provide a very good start. Additionally, taking note of his citations and references will allow one to increase that reading list even more.

V. Comments from Others Regarding Dr. Harrison's Legacy

My ten-year plus professional association and friendship with Al Harrison was unfortunately too short. However, many of his collaborators and friends had a longer association with him, which they share here. They include individuals from NASA, universities and colleges, and other organizations. Because these quotations come from individuals who have known and worked with Albert Harrison for a longer time than this author, their insights are all the more interesting and powerful. Interestingly and expectedly, common themes did emerge.

A. Chris P. McKay, Ph.D., Planetary Scientist, NASA Ames Research Center

Dr. Chris McKay comments on Dr. Harrison's knowledge regarding space issues, his commitment to space exploration, and his high quality as a person. As indicated, he worked with Dr. Harrison for a long period of time and recognizes his important contributions.

> *I first met Al at a seminar at UC Davis on Antarctic expeditions. I had already been working in the Antarctic for several years and we talked about how they provided useful models for space. One thing led to another and we teamed up to host a conference on Antarctica and Space with support from both NASA and NSF. The outcome was a nice book:* ***Harrison, A.A., Y.A. Clearwater, and C.P. McKay, editors, From Antarctica to Outer Space: Life in Isolation and Confinement, Springer-Verlag, New York, 1991*** [Harrison et. al, 1991]. *[Emphasis added]. It was a pleasure working with Al. He was extremely knowledgeable. His enthusiasm for human exploration was contagious, and most of all, he was a fine person to know and work with.*

This is an excellent example regarding Dr. Harrison's acceptance by the space community as a scientist and a person. As a social scientist, this was quite rare, especially working with NASA personnel during the early 1990s. Dr. McKay succinctly summarizes Albert Harrison's professional and personal attributes that garners praise from seemingly all those with whom he interacted. Additionally, he influenced others professionally, from a distance, through his large volume of writings.

B. Penelope J. Boston, Ph.D., Director, NASA Astrobiology Institute (NAI)

Dr. Boston knew Albert Harrison for quite a while. While not a social scientist, she was definitely influenced by his scholarship, but like the others who participated in this project, his personal attributes have left a lasting impression as well. Dr. Boston also refers to his vast knowledge on a variety of topics.

> Al Harrison was a gentle presence in any room that he inhabited. Tall and slightly stooped, he seemed to move in an aura of his own good humor and bonhomie. The first time I met Al must have been sometime in the late 1980s or even before. I don't know the actual moment, because he was such a wise and kind influence on whatever he touched, that it still seems to me that he had always been and would always be. Sadly, we know that he has left us, but that spirit that he imparted is timeless in the true sense of the word. The body of formal and informal thought that he produced made a major mark on the area of astrosociology from its very inception to the developmental stage that we see it in today. When I met Al, I had already read *Living Aloft,* coauthored with Mary Connors and Faren Akins. The social sciences are not my area of competence, but that volume was very influential in my thinking about our future in space as a species and the challenges that go with that exploration. Of course, in the many years that followed, I kept up with Al's written pieces, and had many illuminating and stimulating discussions with him about everything from his field to mine and far beyond both! Peace, dear friend.

Thus, Dr. Boston witnessed from afar how Dr. Harrison assisted those of us involved in developing astrosociology to accomplish things that would have proven much more difficult without his guidance and contributions.

C. Peter Suedfeld, Ph.D., Department of Psychology, The University of British Columbia

Dr. Peter Suedfeld writes about Albert Harrison's early roots in social psychology during a turbulent time facing the discipline at which point he refused to contribute to the problems that existed, but concentrated instead on the scientific pursuit of his field, focusing on humans without getting involved in the divisive politics of the time.

> *Back in the 1970s, we experienced a much-publicized "crisis of social psychology." Although colleagues differed concerning what the crisis was about, one widespread view was that the field had devolved into a focus on clever little*

laboratory experiments with unexpected results, and had lost a sense of contact with the important concerns of human lives. Al Harrison was not part of the problem, nor of the "solution" that some colleagues embraced and that turned out to be just as much of a problem: a concentration on "relevance" and applicability, to the exclusion of scientific progress. His contributions used the concepts of social psychology to enlighten us about their previously unrecognized relevance to important concerns.

Dr. Harrison made significant contributions to the areas of space analogs and living in confined ecosystems, and did so in collaboration with others, which was an approach he enjoyed.

Within the space and polar psychology community, Al Harrison's most-cited work is probably that which looks at human adjustment to extreme environments. His 1985 book with Mary Connors and Faren Akins was one of the first serious attempts to codify what long-duration space travelers would need for psychological, not merely physical, health; it, like his 1991 co-edited book on the relationship between polar and space research, with a few digressions into other isolated, confined environments, is a classic. He was not the first to recognize that isolated, confined, extreme environments have common physical and psychological characteristics, but he certainly made an impact on the general recognition of that fact. The proliferation of analogue and simulation studies that forms the basis of much of the subsequent research validates his point of view.

I am quite certain that Albert Harrison's diverse interests were quite evident by his writings and probably allowed him to accept astrosociology more readily.

Al was an exemplar of a scientist who "followed his nose": that is, he pursued research on topics that he thought interesting and worth investigating, regardless of the mainstream. A social psychologist who expresses a serious professional interest in the search for extraterrestrial intelligence puts his reputation at risk; perhaps not quite as much as a devotion to research on extrasensory perception, but pretty close. Al was interested in SETI, therefore he went ahead and got involved. Sometimes he ventured even further afield. His speculations about the likely benefits of contact with an advanced alien culture were optimistic – for some colleagues and readers, much too optimistic. His even more recent excursion into philosophy, religion, and folklore were even more of a departure from the highways of social psychology.

One of the common themes found in these remarks emphases Dr. Harrison's personal qualities, not just those associated with being a well-respected scientist. He was considered to be a person of high character according to everyone with whom I have been in contact over the years.

I cannot write about Al without commenting on his personal qualities. He was mild-tempered, pleasant, considerate, open-minded, tolerant of disagreement and criticism. In our many years of working on committees together, sharing (and sometimes arguing) ideas and opinions, his tone never became harsh or impatient. His untimely death is a blow to his colleagues and friends, and to the intellectual realms to which he has contributed so much.

D. Steven J. Dick, Ph.D., SETI Institute Scientific Advisory Board, METI International Board of Directors

Dr. Steven Dick discusses Albert Harrison's contributions to astrobiology, one of his major areas of emphasis along with planetary defense, SETI, space settlements, living on spacecraft and extreme environments, and behavioral health, among many other areas of research.[6] As he relates here, however, Dr. Harrison was a pioneer in the field of astrobiology, and I would add SETI as well.

I can say that I use and cite Albert Harrison's work all the time. For me his most relevant work was on the societal implications of astrobiology, and his book After Contact remains the first important book on the subject, now followed by Michael Michaud's Contact with Alien Civilizations [2007], the Library of Congress volume I edited, Impact of Discovering Life Beyond Earth [2015, and soon to be followed by my own volume. In other words, he was a pioneer in the subject. We first worked closely together at the NASA conference on the subject back in 1999, and I marveled how he could write so quickly and with such originality and fresh perspectives.

Like myself, Steven Dick is impressed regarding Al Harrison's prolific work ethic and original contributions to NASA, which is quite rare (as well as those to other elements of the space community and academia). Steven Dick is well known and respected in the field of astrobiology, and he was the Chief Historian and Director of NASA's History Office. Therefore, calling Albert Harrison "a pioneer" in such an important field is quite a tribute.

E. Sheryl L. Bishop, Ph.D., Social Psychologist

Dr. Sheryl Bishop describes how Dr. Harrison influenced her and her career quite elegantly. She also refers to his legacy as a social psychologist, though his influence went well beyond any single discipline, impacting those working in both branches of science.

My first introduction to Al Harrison was through his collaboration with Yvonne Clearwater and Chris McKay on the book ***From Antarctica to Outer Space: Life in Isolation and Confinement, 1991.*** [emphasis added].. *The book became my bible for the next decade as I took my shiny new doctorate in social psychology and created a career in exploring team performance and group dynamics in extreme environments. Albert was the living proof that social psychologists*

[6] See Appendix A for references covering these issues in addition to those in the references section.

were relevant to the discussion of humans expanding into space but were fundamentally critical to the formative development of choices about whom would be initially fit to be our first pioneers and what would be the organizational/societal structures to best support the expansion of an entire species into a new frontier. His contributions to every aspect of human-centered inquiry related to the exploration and settlement of extraterrestrial environments are woven into the fabric of existing knowledge, thought and theory. Had he only remained an iconic figure to emulate, it would have been a significant contribution to my development as a behavioral scientist in the space arena. However, he was never one for remaining on any pedestal he found himself, and quite readily engaged a broad spectrum of others in lively discussion, exploration, challenges to existing paradigms and open-minded skepticism. He taught me the value of being a generalist in both spirit and intellect. When the new field of astrosociology was first proposed, Albert and I engaged in long email conversations about the necessity/wisdom/implications of advocating for yet another specialty domain. In the end, we agreed that the need was not being sufficiently filled by existing domains of focus nor would likely be adequately encompassed in the near future. Hence, our enthusiasm for the birth of a new field that focused specifically on the myriad issues surrounding the human diaspora from Earth emerged. Albert will always be the model social psychologist to those of us who follow. I'm sure his spirit is eagerly exploring the way ahead as he waits patiently for us to get this show on the road.

Dr. Bishop was strongly influenced by Albert A. Harrison, as her comments reveal. Before I met him, I read many of his works, and he inspired this sociologist in much the same way. It is interesting and fortunate that Sheryl Bishop and Albert Harrison discussed the merits of astrosociology, presumably soon after I contacted him, and both found the field worthy of support. Fortunately, for the effort to develop astrosociology successfully, each of them agreed to join ARI's Advisory Board.

Such was not the case among everyone who voiced an opinion about astrosociology. For example, one blogger in 2004 titled his initial piece "Putting the 'Ass' in "Astro,"[7] which I presumed by the title when I first encountered it, did not indicate support for the newly proposed subfield of astrosociology. I was correct, of course, but this anonymous blogger who called himself "Drek" did allow me to respond after I contacted him.[8] Nevertheless, the negative commentary on the web and in email messages discouraged me to some extent, at times perhaps to the point that I thought about ending my efforts altogether. In the end, the positive voices overwhelmed the negative ones and I kept up my efforts, especially due to the encouragement of Albert Harrison.

Dr. Bishop added the following comments via a second email message in support of her first sentiments regarding the aftermath of dealing with the space community in their efforts to legitimize the social sciences, which were not positive experiences by any means.

Yes, there was quite an in-depth discourse about the viability/need for a new subfield so especially focused on a yet-to-be phase of human expansion/evolution. You have to appreciate that those of us in the social sciences had a certain amount of PTSD from the historical defense for legitimacy against the disparagement from the 'hard sciences' Thus, the prospect of embracing another field that had yet to reach a threshold of evident need or immediate application in the minds of others meant becoming vulnerable once again to criticisms we had already bled to silence. I'm afraid that the fortress mentality we see so prevalent in NASA was alive and well in academia as well. I'm sure I wasn't the only one Al discussed this with. I don't want to imply that our ruminations were central to any subsequent decision he made to support ARI. Knowing Al, he was almost certainly having a myriad of conversations with many others. The fact that he so publicly and substantially took a position of support for ARI speaks to his wonderful disregard for walls and barriers. His approach was to throw open the fortress gates, lower the drawbridge and invite the outsiders to dinner. Just remember, evolution is a process. This is true for the emergence of astrosociology as well.

Dr. Bishop reiterates her experiences before the advent of astrosociology regarding the difficulties of getting the social sciences accepted as legitimate science, an unfortunate process that early supporters of astrosociology had to repeat, and those of us who continue the effort still continue to endure. It was an unfortunate set of circumstances that Dr. Harrison had to suffer through once again after he decided to support astrosociology,

[7] This blog is called "Total Drek. Link: http://totaldrek.blogspot.com/2004/06/putting-ass-in-astro_29.html. I will allow the reader to review its contents without further commentary here. At the time, I was proposing astrosociology at an American Sociological Association (ASA) session, similar to an AIAA Technical Committee. The purpose here is to demonstrate that a negative climate existed early in the development of astrosociology. There were detractors and supporters, to be sure, but it was a difficult time during the first two years or so due to the criticisms that I received via email that seemed overwhelming at times. Dr. Harrison's (and Dr. Bishop's) early support helped tremendously, which provided me with the confidence I needed to keep pursuing the development of astrosociology as an academic field.

[8] I titled my response as follows: "Astrosociology: A Necessity Rather than an Absurdity." At this early stage, I commented on astrosociology as a subfield of sociology rather than as a multidisciplinary field, which evolved soon after this writing, significantly due to the impact of Dr. Harrison. Link: http://totaldrek.blogspot.com/2004/07/today-there-will-be-little-less-drek_15.html.

though he was armed with greater insights as to how to handle the situation. He wrote about the difficulties astrosociology supporters would face early on based on his previous experiences, as discussed earlier. He told this author that it was much easier the second time around.

F. Christopher M. Hearsey, J.D., M.S., Chair of the ARI Board of Directors and Editor-in-Chief of the Journal of Astrosociology, and Director of Legislative Affairs for Bigelow Aerospace, LLC

Chris Hearsey's career, like many others, was shaped by knowing and working with Albert Harrison. The influence of his scholarship was a key part of it, but it was also due to his personality and his willingness to provide his time to collaborate and discuss issues.

> *Dr. Albert Harrison was a unique, wonderful person. I was first introduced to Dr. Harrison and his extensive scholarship and brilliant character through working with Dr. Jim Pass and after joining the Astrosociology Research Institute (ARI) in 2009. Dr. Harrison was an excellent, thoughtful, and knowledgeable academic. But more importantly, he was a great collaborator. His dedication to making social science better, clearer, and more accessible is a hallmark of his academic legacy. Dr. Harrison's studies on the various relationships between humanity and the outer space environment paved the way for astrosociology by laying the foundation for the concept in social science methodologies and analogs. Moreover, Dr. Harrison was instrumental in the development of ARI as an active advisor and collaborator. For these reasons, I am grateful for the short time I was able to work with Dr. Harrison. His support and encouragement helped shape my own scholarly career. And with his sudden departure from this planet, I know that his legacy will educate and inspire generations to explore and someday inhabit other worlds beyond our own planet.*

Chris Hearsey also recognizes that Dr. Harrison's career-long scholarship provided the basis for a large percentage of the foundation for astrosociology and that his short time with ARI, though it actually spanned nearly the entire existence of the overall effort to develop astrosociology, provided a powerful impetus for us to continue our work in his memory. Indeed, much knowledge still needs to be derived from his writings, and it is quite clear that future students of astrosociology will have much material to occupy their time and their minds.

G. Final Thoughts Regarding the Contributors' Comments

Several themes emerged from those who participated in this exercise. These comments are very likely representative of his impact on his other colleagues and friends as well. The impressive reality is that his influence transcended his own discipline of social psychology. He provided insights that continue to prove valuable to space scientists and social scientists alike.

The one element that was perhaps the strongest message focuses on Albert Harrison, the person. His influence would perhaps have been much less impactful had he not possessed his intellect, of course, but also the personality that allowed him to share his ideas with others and prompted them to want to work with him. The human dimension describes the orientation of his scholarship and the importance of bringing in the social and behavioral sciences, but it also reflects the humanity in the person. Albert Harrison brought an air of cooperation and friendliness to people from all types of different backgrounds who were better off from knowing him due to the combination of his personal and professional attributes. (See Appendix C for a personal example of his graciousness).

Several individuals, including myself, related how strongly Albert Harrison influenced their careers. He imparted a strong positive impact on social and behavioral scientists as well as humanists, of course, but he also influenced others who work as physical or natural scientists such as Drs. McKay and Boston. There is no doubt that he had a great impact on many of those within NASA and other non-social-science organizations with whom he worked. It seems as though he worked with people in the space and social science communities, universities, and public and private organizations in an effort to tie them all together within his own personal sphere of influence.

Dr. Harrison's high level of scholarship is unquestioned among those who worked with him and I strongly suspect those who have read his works as well. This author has experienced his applied intelligence characterized by his ability to produce new written products at an astounding rapidity. His mastery of the literature in his areas of expertise was impressive. It allowed him to put together reference lists and related citations at an astonishing speed. Moreover, his output was of high quality and pushed astrosociology and other space-related fields forward in terms of the knowledge gained and new directions to explore.

Another theme relates to the foundation for astrosociology He fostered collaboration with others throughout his life, which brought people together who normally avoided the social sciences, creating a web of interactions within the social sciences and across the bridge to the STEM-based scientists and scholars in the other branch of science. This legacy is what provided the foundation for astrosociology. He was one of the few who recognized the importance of collaboration and convergences long before this field was established, but it played a very important part in laying the foundation for astrosociology. As a great bonus, his support and work with this author and others who were involved in the development of astrosociology before 2008, and then afterwards once the Astrosociology

Research Institute was formed, provided much more structure upon that foundation that continues to serve to carry ARI and its supporters forward toward better things ahead.

Thus, his legacy relates to Albert Harrison, the person, as much as it does Albert Harrison, the social scientist and scholar. Again, the combination of the two resulted in an increase in his impact on both space issues and people. For this reason, it seems, he was able to introduce and expound on the human dimension to a larger segment of both the space community and the social science community, even though space scientists largely forsake the social sciences and social scientists largely ignore space issues. Another related theme, then, is the unmistakable fact that Dr. Harrison went out of his way to promote a multidisciplinary agenda and practice interdisciplinary scholarship whenever possible.

A final theme relates to the fact that Dr. Harrison left us much too early. He was only 74. We do not know what else he could have enlightened us with, but we are certainly grateful for what he did give us.

VI. The Human Dimension

The foregoing clearly demonstrates the importance of the human elements of space exploration, spaceflight, space settlement, and the impact of space activities on Earth. Human beings still explore space whether they engineer probes, landers, or orbiters; or if they remotely analyze data that they send back. They do not need to leave the Earth's atmosphere to do so. Thus, the human dimension refers to the idea that humans benefit from space exploration and the idea that rockets and other hardware, as well as the science that makes exploration possible, are human endeavors; and additionally, they represent extensions of society in the form of material culture. The concept of the human dimension was part of his book title, *Spacefaring: The Human Dimension* (Harrison, 2001), but it was always part of the approach taken by Dr. Harrison throughout his career. As Dr. Harrison (2001:36) pointed out in this book, "[p]sychological and social factors have always been important, and, as we look to the future, they will become increasingly so." Over a short period of time, ARI staff and its supporters began to borrow this concept that "astrosociology is study of the human dimension of outer space" as a central mantra. It provided a new orientation in addition to the idea of a concentration on "space and society."

A. Two Branches, One Goal

Research and education regarding space issues strongly tend to favor approaches that take the human being out of the equation. Except for specialties such as spacecraft ergonomics and space medicine, for example, which emphasize the human body rather the whole human being (including vital social, cultural, psychological, and behavioral patterns in social settings), the focus traditionally falls to rocket and propulsion issues. Merging the two branches of science in the context of space exploration and related issues creates a more productive balance for the future. This holistic approach generally melds the physical and social elements involved, and thereby produces a scientific environment that is far more potentially successful than keeping the human dimension on the periphery of space-related research and practice.

Again, this idea of the members of the two branches working together characterizes astrosociology as a multidisciplinary field and thus it also favors interdisciplinary interaction. Albert Harrison emphasized this early in the existence of astrosociology. In this case, he refers to astrobiology and SETI, two of his main areas of interest, but his sentiment below applies to space education and research in general. Additionally, the audience for this paper consisted of sociology students and sociologists at a sociology conference, but one can readily replace the first word "sociological" with "astrosociological" because we were introducing a new subfield at the time rather than an independent social science field.

> Sociological research on astrobiology and SETI is an important contribution that would be welcomed by the physical and biological scientists that spearhead the search for extraterrestrial life, and it should be welcome by policy makers and the public. An effective multidisciplinary approach requires close coordination between the scientists who conduct the search and those who can shed light on the social implications, who can, in effect, help minimize the problems of cultural lag. A satisfactory overall research program would be broad, structured in such a way as to permit meaningful quantitative comparisons, and enable cogent explanations of the findings. Thoughtful and effective collaboration among physical, biological and social scientists may break down the barriers that separate different intellectual fields and move us towards the unification of knowledge (Harrison, 2005:15).

Each space topic does benefit with the convergence of different disciplines, so no matter the combination involved, collaboration is the key for the future. Utilizing the research findings and insights of only half of the scientific realm represents a continuing state of partial comprehension of relevant facts. After all, the unification of knowledge is important since compartmentalized knowledge is limited by definition.

I originally coined the concept of *astrosocial phenomena* to emphasize the need to include social-scientific issues in space education and research. At this point in the development of astrosociology, however, the emphasis

has evolved to the focus on the vital need for collaboration between the "hard" and "soft" sciences; that is, combining astrosocial phenomena with traditional space concerns. It needs to become prevalent on a formal basis, both in the traditional hard science-oriented space community and the social science (and humanities) disciplines. Otherwise, the human dimension will continue to remain at a secondary or even tertiary level, even while human beings will continue to become more involved as spacefarers and more affected by astrosocial phenomena. Such a circumstance defies logic and should receive remedies as soon as possible. Dr. Harrison indicated repeatedly that his support for astrosociology was based largely on his assessment that an organized social scientific voice on an academic level was missing throughout the space age and he felt strongly that astrosociology filled that requirement, even in its infancy, which, again, at the time represented a giant leap of faith on his part.

A great divide between the two branches existed when we started developing astrosociology (Dudley-Rowley, 2004), and though the divide continues to exist, the divide is narrowing (Pass, 2016). Despite its existence, Albert Harrison was one of the few social scientists who were able to overcome it for approximately three decades. His collaborations also helped to narrow that gap even before he supported astrosociology. Moreover, his work focusing on astrosociology and later working with ARI continued the process. As he relayed to this author, and as his writings clearly suggest, the multidisciplinary nature of the astrosociology provides a good framework for a greater level of collaboration into the future.

B. *Humans* Conduct Space Exploration

Regardless of where space scientists and engineers reside when conducting research or educating students, even when on Earth, they are explorers of space. They do not need to exit the Earth's atmosphere. They only need to focus on a space-related issue or set of issues. They may not be astronauts, but they do not have to be. They are nevertheless, explorers. The scope of astrosociology reaches out to study how these explorers conduct their work and how their work relates to the larger scheme of things, such as their contributions toward moving toward a true spacefaring society.[9] Humans conduct space exploration from spacecraft, from offices, from research laboratories, from their garages and backyards, or from wherever they happen to work.

The concept of the human dimension indicates the simple fact that space exploration and related issues involve humanity and strongly implies that it is impossible to understand the full breadth of it without the involvement of social scientists and humanists, and thus it involves the social-scientific implementation of the scientific method. It also implies that material culture, or the things that humans build such as spacecraft and space probes, require the collaboration between the two branches of science in order to understand their impact on societies. Human beings conduct space exploration. They are the only animals in Earth's history to do it, and therefore their behavior must be studied along with the physical phenomena studied by astronomers and physicists. This is what Albert Harrison wanted, as the excerpts from his writings in this paper (and elsewhere) indicate, and this is what astrosociologists aim to do as astrosociology develops.

C. STEM, STEAM, and Astrosociology

Something very glaring is missing in the STEM, and even the more inclusive STEAM, acronyms, as already mentioned. The latter added the arts to hard science, technology, engineering, and mathematics. Nevertheless, the social and behavioral sciences as well as the humanities remain strangely omitted in mainstream space discourse, though more formally than informally. The "S" in both acronyms refer to the "hard" sciences as if the so-called "soft" sciences do not utilize the same scientific method, rigorous theory building, and unbiased empirical investigative techniques; as if human behavior is somehow not subject to any scientific laws whatsoever (Pass and Harrison, 2016). There is something missing, as has always been the case before 2004 and the status quo continues to prove itself quite formidable.

Yet, as discussed throughout this paper, humans are at the heart of space exploration wherever they reside, so why are social science concerns secondary considerations at best? Can humans really travel to Mars and live there without taking into account the lessons learned by social scientists who have studied terrestrial societies for centuries? What about the effects of isolation? Why is such vital knowledge disregarded by so many? Why do the mainstream contingents of the social sciences themselves ignore space issues?

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[9] A spacefaring society, as defined here, is contrasted against a space-capable society and a nonspace society. A nonspace society has no access to space. A spacefaring society is more advanced than any contemporary society and astrosocial phenomena ubiquitously affect all institutions and aspects of daily social life. It is an ideal type, a model that will never exist though it is a reality for which societies strive to attain. In contrast, a space-capable society possesses the capacity to reach space on its own accord. It possesses some of the mileposts (achievements) that move it along the continuum toward a spacefaring society. See Pass and Harrison (2007) for a full discussion.

The answers to such questions remain difficult to fathom, yet these conditions still describe the status quo. The inroads made by social scientists and astrosociology (aided by ARI), while important, thus far represent only a very small dent into the hard shell of ignorance that surrounds space exploration from a social-scientific perspective. Yet the work of Dr. Harrison in the development of astrosociology has helped to make the road ahead look a bit smoother than it otherwise would have been. We have gained some traction in our efforts due much to his efforts to legitimize the field. At this point, we need to heed his message to bring in more social scientists and humanists.

The answer does not mean that an unbridgeable schism exists between STEM and STEAM versus astrosociology regarding space-related matters. Rather, bridging the great divide by strengthening the collaborative efforts between those working in the two branches of science and getting more social scientists and humanists to participate represents the best course of action. This is something that Albert Harrison strongly believed. Furthermore, it is something that the astrosociology movement is working toward achieving. Thus, the future of the relationships among STEM, STEAM, and astrosociology must not become antagonistic or inattentive to one another. They must instead become complementary and foster collaboration.

VII. Conclusion

Many individuals from the social and behavioral sciences as well as the humanities have written about space issues through the years, but few have been as prolific as Albert A. Harrison and few have been as influential. He was definitely a pioneer in many ways long before I presented the concept of the "astrosociological frontier." His level of production in the area of space topics is probably unmatched. As such, I contacted him initially because of his work and saw it as foundation for astrosociology before I announced the existence of this new field. To my surprise, and vindication in a sense, Dr. Harrison came to view it in much the same way. As noted in Dr. Bishop's comments, Dr. Harrison came to this conclusion after discussions with others, though I never knew about it until this writing because he seemed to voice his support almost immediately. I now suspect that his initial indication of support to me was contingent on his earlier discussions with others in conjunction with his experience at our first conference together in 2005. Luckily, he was impressed enough with my presentation and explanation of the emerging field of astrosociology at that early juncture to voice his continued support; at least that is my guess, because we never discussed the factors that went into his support for astrosociology so early in its development.

By focusing on the human dimension and working within the space community, Albert Harrison was able to build a body of work that provided a substantial part of the foundation for astrosociology, which I cannot emphasize enough. His possession of the astrosociological imagination allowed him to delve deep below the surface of space-related, or astrosocial, phenomena allowing him to recognize hidden realities and make unconventional connections among them. This is quite evident based on his reputation among his peers, as represented here, and the diversity of his writings. Indeed, several of his peers declined to comment, but still acknowledged his monumental impact. Thus, everyone interested in any aspect of spaceflight, space exploration, space settlement, or any issue involving space should know of Dr. Harrison's work. He was one of the pioneers from the social science branch, and his writings have relevance for both those studying rockets in space and those more focused on people in space, and each should know about the issues that tie the two branches of science together.

To honor his legacy and the contributions of many others, a very good start would be to add *social science* to the "S" in STEM and STEAM, which would demonstrate that space educators and researchers understand that the scientific method applies to all the sciences, even when the subjects are human beings and the things that they do often seem unpredictable or random. Science is science, and focusing on the human dimension implies that complete knowledge about space issues – or anything involving human beings for that matter – remains impossible to acquire when the social sciences and the humanities are left out of the investigative process. This abrupt change in the status quo will require an understanding of the best models of collaboration that currently exist, along with thought focusing on how to improve them if possible, and applying them in a more universal and formal manner. Once this becomes a serious reality, the human dimension will receive its due place in scientific and technological efforts focused on space or any other phenomenon, but only if those working in *both* branches of science commit to it.

In the end, as Dr. Harrison demonstrated, the two branches of science represent two sides of the same coin. Each one is necessary, but neither is sufficient alone to maximize the success of human space exploration and to move toward a true spacefaring civilization on Earth. Combining the physical dimension and human dimension together represents the best approach for studying and researching space exploration issues. The status quo has made it possible to go to the Moon for short stays and conduct other cislunar activities, but it is inadequate to allow humans to truly explore and occupy translunar space on a sustainable and livable basis.

Thus, while it has always been the case, now it has become crucial that the physical and social approaches interact on a formal basis going forward. Otherwise, it is doubtful that successful human actions in space will reach

their full potential and may even result in preventable failures that could harm spacefarers. Albert Harrison's body of work (along with others', of course) has resulted in a climate in which the social sciences and humanities have become somewhat more accepted within the space community. The difference is that Dr. Harrison took a very early interest in astrosociology and actively participated in its development, not only though his support, but also by producing invaluable output. This trend has benefitted ARI and other similar social-science-oriented organizations. Rocket science and social science must embrace interdisciplinary efforts. Academia as well as other public and private organizations in both branches of science must cooperate much more inclusively rather than championing only STEM and STEAM. The social sciences and humanities – represented by astrosociology featuring its perspective that strongly emphasizes the human dimension – must become more fully integrated into current and future space education and research efforts. This reality would best honor Dr. Harrison's legacy.

Acknowledgments

It is important to thank Dr. Harrison's colleagues and friends who contributed to this work by providing their comments: Chris McKay, Penny Boston, Peter Suedfeld, Steven Dick, Sheryl Bishop, and Chris Hearsey. I also wish to acknowledge those who anonymously provided suggestions "behind the scenes." Of course, it is impossible to place a value on Dr. Harrison's scholarly legacy, his friendship, and his support of astrosociology and the Astrosociology Research Institute. His prolific contributions on a number of fronts will have repercussions on the study of the human dimension of space exploration, and specifically, astrosociology, for years to come. We were honored to know and work with Albert Harrison (see Figure 1 in Appendix B). It remains unclear whether the development of astrosociology would have been as successful or even possible without him. We cannot possibly thank him enough, but this testimony attempts to do so in some small way.

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Appendix A

The following references by Dr. Albert A. Harrison (and others in collaboration with him) are listed below as a convenience for the reader who wishes to become familiar with his work. It is an important reading list for anyone who wishes to pursue astrosociology or understand space issues from a social-scientific perspective more generally. These references were not cited in the previous section, as this paper focused on his support for astrosociology for the most part. However, these are important works that significantly contributed to lay the foundation for this field. These works should become familiar to future astrosociologists and those who wish to broaden their perspective beyond STEM-based knowledge. As related several times in this paper, the two branches of science are complementary, and together they are synergistic toward the production of new knowledge related to astrosocial phenomena or space-related issues that is impossible from within either branch alone.

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Appendix B

Figure 1. Dr. Albert A. Harrison

Appendix C

I located this book (Harrison, 2007) while conducting my research. Dr. Harrison graciously autographed it for me. His comment calling me "the world's premier astrosociologist" demonstrates much about his gracious nature.

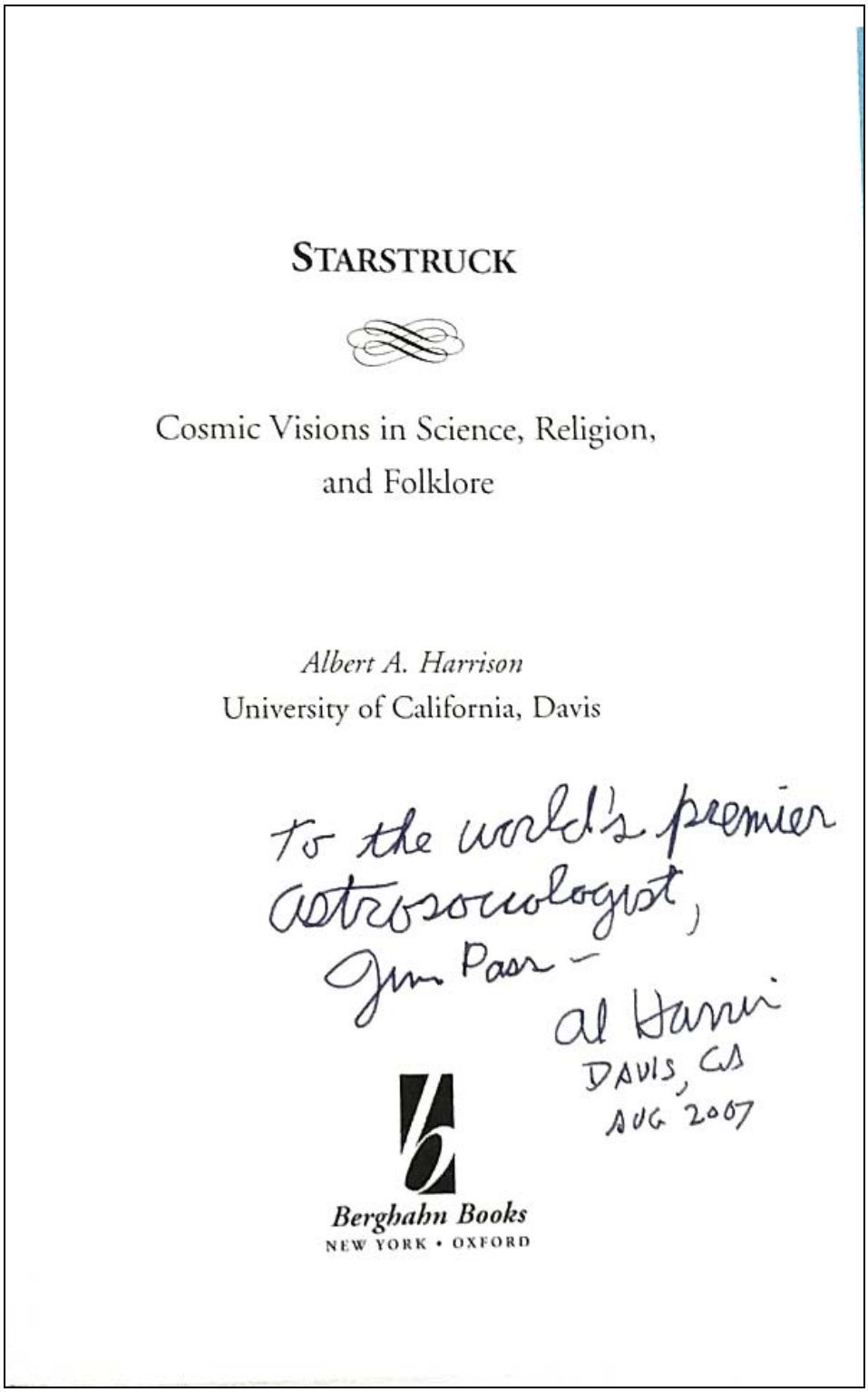

Figure 2. Photo of autographed copy of *Starstruck* book by Dr. Harrison.