Astrosociological Insights
Newsletter of the Astrosociology Research Institute
Volume 4, Issue 1 - March 2015

The Untimely Passing of a Dear Friend and Colleague

Jim Pass, PhD
CEO, Astrosociology Research Institute

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. I only knew Al for just over ten years, which was too short a time, but he had a huge impact on my personal and professional life. 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. He even participated with me in a session called "Astrosociology: The Sociology of Outer Space" in a California Sociological Association conference as early as 2005, only a little more than a year after I first announced the founding of astrosociology at Astrosociology.com. It took place in Sacramento near his home in Davis, CA. His paper, titled *Overcoming the Image of Little Green Men: Astrosociology and SETI,* is available in the ARI Virtual Library.

Albert A. Harrison

Anyone interested in space education and research from a social science perspective should read his seminal work, ***Spacefaring: The Human Dimension***, 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. We just collaborated on a chapter for an upcoming Springer publication focusing on the role of astrosociology in encouraging convergences among the science and technology disciplines and fields. He sent me his final edits just before leaving us. He also has a chapter in our upcoming *Launching Astrosociology* book, another jointly authored chapter focusing on movement toward true spacefaring societies, and an article in our inaugural issue of the *Journal of Astrosociology*. We will dedicate both the book and our first *Journal* issue to Al as small ways to honor his memory.

Al told me he was happy that we were dedicating this issue to astrobiology and SETI. He was a pioneer in the application of social scientific analysis to space-related issues, with a great level of interest and influence on SETI issues, including important work with NASA. I teased him more than once that he was doing astrosociological research long before the idea of astrosociology hit my brain in 2004. He was quite humble, but he could not really disagree with me on this issue. Al was also our first ARI Advisor, and ARI will never be the same without his input and guidance.

I, along with a great many in the space and astrosociological communities will dearly miss him. Our condolences go out to his family as well as colleagues, and friends both within ARI and outside of it.

In this Issue

Kathleen D. Toerpe, PhD

Editor

Astrosociological Insights

This issue of *Astrosociological Insights* spotlights how the methodologies and insights of astrosociology provide a lens to focus on the assumptions, challenges, possibilities, and consequences related to research in exploring the definition, frequency, and characteristics of *life* in the universe – the core work of astrobiology. Answering the ancient, yet still open question, "Are we alone?" -- whichever way the ultimate answer goes -- will be a defining milestone in human history that will likely trigger paradigm shifts in how we see ourselves and our place in the universe. Some of our prompting questions for this issue included:

The Search for Life

- What kind of *life* are astrobiologists looking for, and how will they know when they find it?
- What are the public perceptions and attitudes regarding extraterrestrial life and its possible discovery?
- What factors have encouraged the growing academic and popular acceptance of the field of astrobiology?
- What is the current relationship between astrobiology and SETI (Search for Extraterrestrial Intelligence)?
- How have various academic disciplines, social institutions, and governmental bodies become stakeholders in astrobiological research?
- What is the range and impact of online or crowd-sourced searches for extraterrestrial life?

Human Readiness for Astrobiological Discoveries

- How do nations that struggle with human differences ready themselves for extraterrestrial diversity?
- What preparedness, outreach, or education programs can help prepare individuals and societies for confirmatory evidence of extraterrestrial life?
- What are the collaborative possibilities for astrosociologists to actively participate in readiness initiatives?

Microbial Extraterrestrial Life

- How should public concerns about possible microbial contamination be addressed through policy and global space governance?
- Who will "own" extraterrestrial microbes and who will control their uses, availability for research, security protocols, etc.?
- What plans should be in place to prevent the nationalist exploitation or military weaponization of extraterrestrial microbes?
- What are the social and cultural implications should proof of a "Second Genesis" be found?

The Astrosociology Research Institute is an Educational Nonprofit 501(c)(3) organization incorporated in the State of California.

Intelligent Extraterrestrial Life

- What are the real chances of discovering intelligent or communicating extraterrestrial life? Is the Drake equation still a valid model or do competing predictive models exist?
- What expectations do humans already have about intelligent extraterrestrial life? How do these influence astrobiological and SETI research?
- Should intelligent extraterrestrial life be detected and confirmed, what happens next? Who speaks for Earth?
- Should we attempt to communicate, if possible? What should we message back?

Anticipating Human Reactions

- How can predictive models be useful for anticipating reactions to presumptive discoveries of microbial life vs. intelligent life (e.g., Rio Scale, London Scale, etc.)?
- What is the usefulness of historical analogs (Columbian Exchange, Enlightenment, etc.) in predicting human reactions and acceptance of the knowledge that extraterrestrial life exists?
- What protocols or procedures should be followed for informing the media and the public about presumptive discoveries? How do these protocols anticipate mass media attempts to "scoop" the story?
- How do science fiction narratives of extraterrestrial life help or hinder constructive human reactions to astrobiological discoveries?

Deeper Philosophical Issues

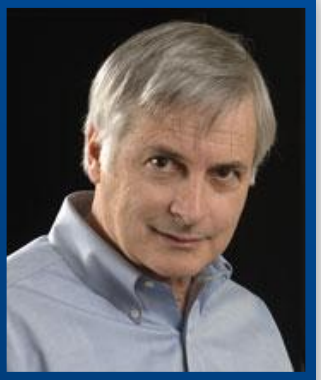
- Should humans even engage in the search for extraterrestrial life at all?
- How do the beliefs and cultures of major social institutions (religious, governmental, etc.) affect or influence astrobiological research?
- How might presumptive astrobiological discoveries affect or influence human social institutions, material and immaterial culture, or psychological worldviews?

This issue doesn't address all of these questions, of course, and not every article in this issue is about astrobiology, but it is imperative that we ask them (and continue to keep asking them!) as we refine the answers in light of changing values, attitudes, and discoveries. Contributor Seth Shostak has suggested, in testimony to the United States House of Representatives' Committee on Science, Space, and Technology in May, 2014, that, with sufficient resources, scientists could discover extraterrestrial life within the next twenty years. Given the historical immediacy and consequence of such a profound discovery, scholars and practitioners from all of the astrosociological subfields need to continue to consider and anticipate what the "human dimension" of such a discovery will mean for us all.

– Kathleen D. Toerpe

Want to know more about astrosociology or the Astrosociology Research Institute? Interested in submitting an article to this newsletter or our peer-reviewed *Journal of Astrosociology*?

Drop an email to ktoerpe@astrosociology.org and we will add you to our contact list.



Seth Shostak, PhD

Senior Astronomer and Director

Center for SETI Research

SETI Institute Mountain View, CA

If We Find ET, Will Everyone Go Crazy?

As an astronomer involved with SETI, the Search for Extraterrestrial Intelligence, I'm frequently asked what would happen if we were to pick up a signal from an alien society that is dozens or hundreds of light-years away. Those posing the question often believe they know the answer: the news would be kept quiet – the discovery would be forcibly hidden, either by the scientists themselves or by a nervous government. Why? Because the public couldn't handle the news. Finding our equals (or more likely, our superiors) in the skies above would somehow grievously disrupt our social equanimity. Or put another way, the *hoi polloi* would go nuts. There are some things man was not meant to know.

This is a truly remarkable claim. There's no mechanism to control information about a SETI discovery, so the premise that it would be kept secret is thoroughly untenable. In addition, there's little reason – other than popular conviction fueled by a century of sci-fi – to think that people would suddenly opt to riot in the streets upon hearing that scientists had registered a signal from deep space.

Indeed, the SETI enterprise has occasionally detected signals that for hours and longer appeared to have all the characteristics of an extraterrestrial transmission. When that happened, the media were all over the story. So we already know that the expectations of a clamp-down on the news are silly, and a breakdown of society even sillier. So what *would* happen? We can start with some facts, namely the types of information that could be immediately gleaned from a SETI detection. These would be the most proximate influences on society's reaction, and few of them seem likely to provoke panic. Here is a list of consequences that are easy to imagine and safe to predict: Careful scrutiny of the signal will quickly tell us where the transmission is coming from. Antenna arrays can pinpoint the signal source on the sky, and standard astronomy techniques will allow us to establish how far away the broadcasters are and what type of star they orbit. An intense search for planets might conceivably reveal something about the nature of the aliens' home, although small worlds, similar to our own, can be hard to find.

Variations in the frequency and strength of the signal – assuming it's a continuous transmission – would tell us the length of their day and year. That information, combined with the characteristics of their home star, would give us some indication of the average temperature on ET's planet.

Such simple deductions as these might be all we learn in the first few months following a SETI detection. They might be all we *ever* learn, other than the fundamental fact that we're not the only thinking inhabitants of the cosmos. And that latter revelation is unlikely to cause the populace to panic, as most of them are already perfectly comfortable with the idea that we share the universe with other sentient species. After all, they see them in movies and TV shows every week.

If We Find ET, Will Everyone Go Crazy? (cont.)

In addition, there's the straightforward fact that detecting a signal is not dangerous. The aliens will be unaware that we've tuned in to them. No one should be discomfited by fear of imminent havoc at the hands of some extraterrestrial meanies. But in the long term, this short laundry list of knowledge gained in the first months or years following a detection might get longer. It's safe to say that, after picking up a signal, there will be a strong incentive for someone to grab a microphone and reply. Of course, striking up a conversation might be impractical if the signal is coming from a star system hundreds of light-years away, and there are some people who think that transmitting is too dangerous in any case. But if we make an attempt to get in touch (and it's hard to think we wouldn't), doing so would be societally important. It would (a) force us to decide among ourselves who speaks for Earth, and what they should say; and (b) give humanity a collective interest in a long-term project, namely waiting for a reply. Both of those consequences of a SETI success are of substantial import. But if we were to *get* a reply, and could understand any of it, that would be far more interesting. After all, any society whose signals we can discover will be more advanced than us. What they have to say might be just as revelatory as what modern humanity could tell the Romans.

Suddenly experiencing a fire hose of advanced knowledge would change the consequences of SETI from simply knowing that other thinking species exist to somehow becoming part of a larger society. It is difficult to imagine a more momentous development.

However, this scenario is highly speculative. The distances between star systems and the tremendous age of the universe suggest that no two societies are likely to be very close to one another in level of development. The chances of receiving an understandable message seem small, and it's more plausible to assume that finding a signal will affect us mostly by calibrating the degree to which we're special. The discovery would immediately tell us that, while we might be unique, we're not some sort of miracle. Finding the aliens might not result in a free copy of the *Encyclopedia Galactica*, but it would still be a transformative event.

In view of the very limited information available in the immediate aftermath of a detection, the idea that society would be turned on its head by a SETI success is implausible at best, and risible at worst. Finding company among the stars would simply be one of the greatest news stories of all time.

> *"After all, any society whose signals we can discover will be more advanced than us.*
>
> *What they have to say might be just as revelatory as what modern humanity could tell the Romans."*
>
> *- Seth Shostak*

The Biomechanical Requirements of a Technologically Advanced Civilization

Jeffrey S. Lee, PhD

Assistant Professor (Adjunct)

Center for Astrophysics, Space Physics and Engineering Research

Baylor University

Throughout the years, people have endlessly speculated on how extraterrestrials would appear. The huge diversity of life on Earth shows us what is possible in a single biosphere with a single chemistry. Popular culture frequently extrapolates humans to create humanoid aliens. However, it is incredibly improbable that an independently evolved species with an entirely different chemistry will evolve to resemble us physically.

However, it is plausible that *convergent evolution*[1] exists in most places that life has evolved because there are likely a very limited number of ways to satisfy ecological niches. On Earth, insects, bats, and birds all independently evolved and took to the air by means of the same evolutionary mechanism – wings.

It is clear that no one credibly knows what technologically advanced[2] extraterrestrials would look like, or if they even exist. However, if a species is ever to become technologically advanced, there are (at least) three biomechanical capabilities that it must have. Sufficient intelligence to build a technological civilization is assumed, and is considered to be a non-biomechanical prerequisite.

1. Locomotion

Clearly, any species that is capable of technology is also capable of moving through their environment. Such beings must be able to forage for the raw ingredients required for their contrivances. The silicon, germanium, selenium, copper, etc., from which much of our modern electronics are made, does not wander across a planetary surface; it must be extracted from the locations where, with the exception of being jostled by tectonic activity, it remains immobile.

Thus, non-locomotive vegetation is not going to fabricate radio telescopes. Although the mechanism of this locomotion is uncertain, several possibilities exist. One option is flight. However, a method of powering and controlling this flight is necessary. It would be the largest stroke of good fortune if a species that relied entirely on the random motion of air currents, as do dandelion seeds on Earth, ended up being carried to their planet's mineral deposits. Such a method of flight control could be the independent adjustment of wings, as we see here on Earth, or the internal shifting of body weight in a manner synonymous with hang gliding.

It has been suggested that expelling vapor from the combustion of internally-generated methane could provide significant thrust for a flying creature. Although conceivable, such a "living rocket engine" is probably rare. However, if such creatures do exist, they would have a considerable survival advantage over creatures that relied on muscle energy or random air currents alone for flight. They could conceivably be the dominant airborne predators of their biosphere.

There is a plausible argument that if such creatures do exist, they would also likely be on an

Biomechanical Requirements of a Technologically Advanced Civilization . . . (cont.)

evolutionary path toward intelligence. Since many of Earth's intelligent creatures evolved from predators, it may well happen in this scenario also. Although an "extraterrestrial pterodactyl," whose thrust comes from methane combustion, would undoubtedly be a formidable predator, evolution provides no assurance that this adaptation will lead to high intelligence, let alone technological sophistication. The dinosaurs' only surviving lineage (birds) has not developed astounding intelligence, let alone erudite technology.

Ground-based locomotion generally implies either walking (or hopping) or slithering. The number of legs a life form would have is a case of *energy minimization*. On Earth, creatures larger than about an ounce don't have more than four legs; the energy requirements are too great for massive organisms to operate numerous appendages on a planet with a gravity comparable to Earth. Although a planet with less gravity may permit massive living beings with more than four legs, the gravity cannot be too much less before the atmosphere escapes to space. Regardless of the number of legs, walking is an evolutionary adaptation proven to be highly effective.

Figure 1: Hypothetical methane combusting "Flying Skewers" from the documentary *Alien Planet* [3]

Lack of legs certainly does not imply immobility, as a snake moves very efficiently throughout its environment. An evolutionary path to eventual high technology is certainly conceivable for slithering creatures, although that was not the case on Earth.

Locomotion through an aquatic environment is exceptionally likely in any ecosystem, since all life, as we know it, requires, and almost certainly begins in, liquid water. Indeed, some of Earth's marine life has evolved to high intelligence. Dolphins, whales, and, surprisingly, cephalopods come to mind. However, it is a certainty that marine life in any planetary ecosystem will not develop high technology.

Although people have sophisticated machinery that operates underwater, the prerequisite technologies were developed on land. Manipulation of electromagnetic radiation, which human beings have done so fabulously well and is the prerequisite road to high technology, cannot be done in liquid water, as is the experience of anyone whose cellular phone has fallen into a full bathtub.

2. Vision

To manipulate its environment, an organism must be able to "see" where it is located and what it is doing. However, the binocular vision at optical frequencies that humans possess is not obligatory. Although our sun emits light of all colours, it is thought that human and animal vision evolved the way it did because the brightest light from the sun is in the part of the spectrum that we can see.

Beings living on a planet whose very hot sun emits light in the ultraviolet region of the electromagnetic spectrum may have vision adapted to those frequencies. [4] If organisms that

evolved in the darkness beneath a planetary surface have vision, it may be in the infrared or even in the radio part of the spectrum. X-ray vision, while not entirely inconceivable, is not particularly useful, since it is disadvantageous to always see through almost all of the materials to be manipulated.

Furthermore, vision need not be binocular, in which two eyes form a single image, although that is the case with most seeing life forms on Earth. Insects and arachnids are obvious exceptions, with the total number of compound eyes and ocelli varying from zero to eight.

Alternatively, sensitive and sophisticated acoustic echolocation, as employed by some mammals, a few birds, microchiropteran bats, odontocetes (toothed whales), and shrews would suffice. Some of these organisms may be effectively blind optically, although functionally, they are extremely "well-sighted." Such beings could locate resources in their environment with much greater effectiveness than the minimum necessary precision. However, it is improbable that an extremely hot star will have planets inhabited by highly evolved organisms because the lifetime of hot stars is much shorter than the lifetime of sun-like stars, permitting far less time for life-development and evolution to occur.

3. Dexterity

Finally, fine motor skills, allowing for the precise manipulation of resources, are essential for the development of high technology. Although electromechanical machines are capable of far greater dexterity and with much smaller objects than are human beings, the chain of industries that led to those contrivances was fostered originally with human legerdemain.

Human beings' manual dexterity is possible because of opposable thumbs, but it is by no means the only mechanism for nimbleness. Mandibular manipulation with a rostrum is extremely plausible, as birds are highly capable of manipulative adroitness of their environment.

The level of dexterity required for a technologically advanced civilization is not extreme. Rather, the absolute prerequisite is the ability to construct a succession of contraptions of increasing complexity, each capable of higher precision manipulation than the preceding one.

The High Technology Road

The path to high technology, as it happened on Earth, is shown in Figure 2. The required time for a hypothetical extraterrestrial civilization to attain high technology tools is uncertain and undoubtedly highly variable.

Biomechanical Requirements of a Technologically Advanced Civilization . . . (cont.)

Conclusion

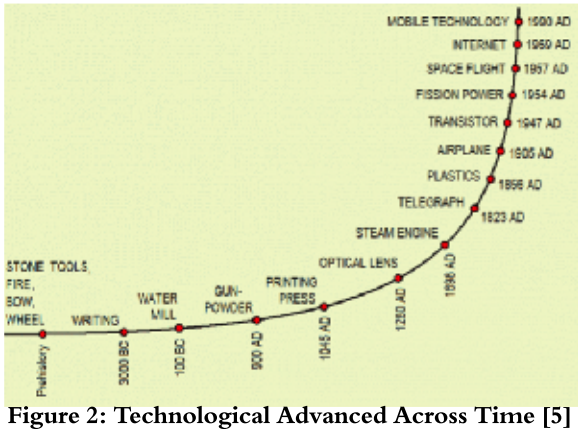


Figure 2: Technological Advanced Across Time [5]

Although the precise physical form of hypothetical, technologically advanced extraterrestrials remains largely unknown, the biomechanical requirements of locomotion, vision, and dexterity are fundamental. Nonetheless, an intelligent species with these essentials is far from guaranteed to evolve technology. Numerous impediments exist along the road to modern electronics; mass extinctions, lack of impetus, and competition for resources necessary for survival are challenges that would be faced by all life everywhere. Nonetheless, if extraterrestrial life has managed to survive, build a civilization, even take to space, and if we ever do meet such beings, then the act of shaking "hands" might not be as farfetched as first thought.

Notes

1. The process whereby unrelated organisms independently evolve similar traits as a result of needing to adapt to similar environments.

2. For the purposes of this article, the minimum definition of "technologically advanced" is technology at the level of the Electronics Revolution.

3. Source: http://aliens.wikia.com/wiki/Skewer?file=Skewer.jpg

4. However, it is improbable that an extremely hot star will have planets inhabited by highly evolved organisms because the lifetime of hot stars is much shorter than the lifetime of sun-like stars, permitting far less time for life-development and evolution to occur.

5. Source: http://awesomescience.us/wp-content/uploads/2014/07/Technology-Singularity.gif

---

Editor's Note

Please note the following corrections from the October 2014 issue of *Astrosociological Insights*:

Mr. Xavier L.W. Liao's complete affiliation should read Ghent Institute for International Studies at Ghent University in Belgium. He is not affiliated with the X-Physics Propulsion & Power Project.

Ms. Sayuri Tanaka Dijkwel corrected affiliation should read LL.M. in Air and Space Law University of Mississippi School of Law; Sophia University, Tokyo, Department of International Legal Studies. She also publicly acknowledges Professor PJ Blount, who provided research advice for her article.

We sincerely regret the errors. - KDT

Yevgeny Tsodikovich

PhD Student - Game Theory

Tel Aviv University

Ilan Ramon: The Space Locomotive of Israel

The annual space week is held in Israel in the last week on January, in memory of Ilan Ramon, Israel's first astronaut, and his friends who perished onboard the Colombia during STS-107. This year I had the pleasure of accompanying two NASA astronauts, Nicole Stott and Rex J. Walheim during their visit of Israel. After a brief morning stroll in the promenade of Jaffa, we went to the studio of Ynet, Israel's biggest news website for an interview. As we entered the building, we didn't attract much attention. After all, in a major news website such as Ynet, English speaking visitors are a common sight. It all changed when Nicole and Rex went to change their everyday clothes in the dressing room.

The moment they stepped out of the dressing room, wearing the astronaut's blue jumpsuit, with the US flag on the shoulder and the mission patches on the chest, all eyes turned to them. People stopped working and stared at them, whispering to one another with excitement. The braver employees approached and asked for a picture or an autograph. In a matter of seconds they become from normal people to rock stars. The same situation repeated itself over and over again, during the annual international space conference in memory of Ilan Ramon and other activities that they participated in. No matter where they went, the fact that they were in space made people admire them, even if they never heard about them before. Even though the amount of astronauts increases significantly nowadays and we are on the verge of commercial space flights, astronauts are still admired and looked up to.

The above gives a glimpse into the importance of Ilan Ramon to the state of Israel. Yes, Israel was already a spacefaring nation well before he was chosen to be an astronaut, ever since Israel became the 8th country to join the space club by launching a satellite in 1988, but the impact of Ilan Ramon's flight on Israel is well beyond any number of new high-tech satellites that might launched. One image of him floating upside down or talking from space with the Prime Minister boosted the science education in Israel further than anything before.

Ilan Ramon, January 24, 2003; Source: NASA

To commemorate Ilan Ramon, a foundation was established to support STEM education in Israel with remarkable results. The Ramon Foundation supports numerous scientific and educational programs. Every year the Ramon Foundation sends several young professional to the space studies program of the international space university as well as supports PhD students in space related subjects. The Ramon foundation holds an aviators club that serves 200 students from 20 schools during which students are mentored by fighter pilots (like Ramon was). Although the mentoring

Ilan Ramon . . . (cont.)

does not include scientific tutoring or help with the homework, current figures show a growth of 85% in children's grades as well as 100% elimination of violence and dramatic improvement in school atmosphere. Another great venture is the RamonLab – an educational program that comprises 6 schools in Israel and one in the US – to build and send experiments to the ISS, some of which already been in orbit! The list of successful supported programs goes on and on. One can only imagine the impact that a successful return to Earth might have had on the nation.

The secret behind the success of all those programs is that Ilan Ramon, figuratively speaking, is a big fish in small pond. A country as small as Israel can easily relate to one hero and Ilan Ramon is that hero. His journey to space is unique for Israelis and the effect is great, accordingly. When one comes from a country that have sent dozens of astronauts to space or dealing with space his entire time, it is easy to forget the aura that surrounds astronauts, especially for small countries. The Ramon effect, much like the Apollo effect back in the days, is significant and well felt in the last decade in Israel. This should be a model for other small countries, a living example of how to make the most out of successful space flights and their single astronaut.

I encourage big space agencies to think about this effect as they plan the future missions and assign astronauts for those missions, and ask them kindly to invite smaller space countries to join them and send their first or second astronaut to space. Those astronauts can become the locomotives of space in their countries and lead them forward. The revenue from such deal can be huge not only to the small countries but also for the bigger one. Increasing the footprint of other countries in space will benefit all, by creating more international collaboration and cooperation and translate to more global investment in space.

SETI - Astrobiological Considerations

Pauli E. Laine

Department of Computer Science & Information Systems

University of Jyvaskyla, Finland

1. Introduction

Two questions that provoked discussion at NASA's astrobiology strategy meeting in Washington, D.C., March 2014, were about the origin of life and whether SETI (Search for Extraterrestrial Intelligence) should be included in the new NASA astrobiology roadmap [1]. All other issues were dealt in somewhat consensus. Origin of life is one of the fundamental questions, and is still under great debate. It also contains questions about what is life, and how likely phenomenon life is, and thus how possible it is that life has also originated somewhere else. Question about intelligent life somewhere else in the universe is even more controversial. This is partly because over 50 years of radio signal based SETI has not detected any validated observation of artificial signal from extraterrestrial intelligent civilization.

Question about the origin of life seems to be closely related to question about how likely event life is. And in the present stage of our knowledge,

SETI - Astrobiological Considerations . . . (cont.)

life indeed seems to be very unlikely event. There are still open questions in the life's basic building block (proteins and nucleotides) synthesis and the synthesis of polymers and abiotic production of polynucleotides is even more challenging.

If the probability of the emergence of life is unknown, the probability of its way to more complex forms and into intelligence is even more unknown. We do not know what possible evolutionary paths are there to intelligent society and technological culture. Does technology always come along when certain point in social or cultural evolution has been passed? What environmental, physiological and anatomical features are required for technical culture to emerge? In a way, this is a similar question than the origin of life. We have only one example of life and technological culture, and it is hard to imagine alternatives.

We can, for simplicity define the possibility of the origin of life and the emergence of technological culture to be low or high. Then we will have four possibilities: 1) both life and intelligence are high, 2) life is high but intelligence low, 3) life is low but intelligence high, and 4) both life and intelligence are low. Most current astrobiologists seem to favor options 2 or 4. However, there is a lot of variance among different disciplines. But the truth is that we simply do not know what the odds are.

2. Finding Extraterrestrial Technosignatures

For finding extraterrestrial intelligence, it is important for technological civilization to emerge and to survive. For example, signs of large scale agriculture, landscape engineering (e.g. dams), fossil fuel burning, or mining could possibly be optically detected with future telescopes on relatively close exoplanets. Humankind started this kind of cultural activity about 4000 years ago. No other animal is capable of creating such artifacts, perhaps with some exceptions like beaver dams.

Primitive culture signs are in the same class as microbial biosignatures: they must be detected optically and this limits possible target range dramatically. Artificial signs (e.g. pollution) in atmospheric spectra could be detected further away, but it could be hard to distinguish them from natural processes. More advanced civilizations could use energy sources that could cause accidental or deliberate technosignatures, e.g. radio and laser technology, or nuclear energy could cause sings that could be detected much further away.

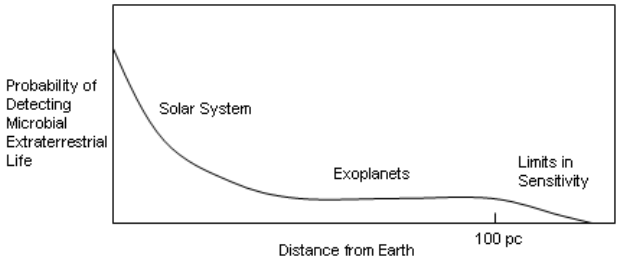


Figure 1. Probability of detecting microbial extraterrestrial life as a function of distance from Earth. [2]

This leads to a situation where the probability of finding extraterrestrial life from microbial to primitive culture level decreases as a function of distance, but the probability of detecting some sign from advanced extraterrestrial civilization increases, at least to some distance (Figures 1 and 2).

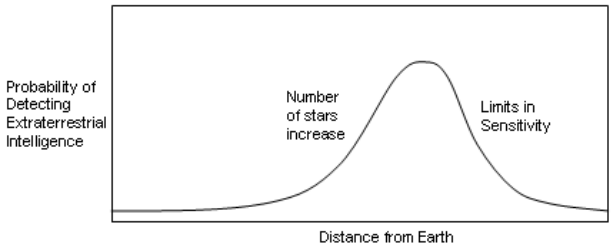


Figure 2. Probability of detecting signs of extraterrestrial intelligence as a function of distance from Earth.

3. Conclusions

Astrobiology is the study of the origin, evolution, distribution, and future of life in the universe [3]. Clear signs of microbial life can be detected only in relatively close targets (within our Solar System), while signs of extraterrestrial intelligence could be detected from farther off. We just don't know how probable events the origin of life and its way to more complex forms and even into technological culture are. For these reasons, the best strategy would be to keep our eyes open for any anomalies and new hypotheses, and to include SETI to funded astrobiology research programs.

Notes

1. Astrobiology road mapping community. www.astrobiologyfuture.org. (accessed on 18 2 2015). This notice is based on author's participation at the NASA Astrobiology Strategy Meeting, March 22-24, 2014.

2. The 100 pc limit is based on discussion with Prof. Abel Méndez, director of Planetary Habitability Laboratory, University of Puerto Rico at Arecibo, June 13th 2014.

3. The NASA Astrobiology Roadmap. https://astrobiology.nasa.gov/media/medialibrary/2013/09/AB_roadmap_2008.pdf (accessed on 18 2 2015).

Student Perspectives

Sourav Karmakar

Undergraduate

Electronics & Communication Engineering

St. Peter's University

Tamil Nadu, India

The Search for Life

Life is the condition that distinguishes animals and plants from inorganic matter, including the capacity for growth, reproduction, functional activity, and continual change preceding death. In outer space, we are looking for such possibilities. But life in outer space could be anything that responds to us, our operations, or our signals. It could be any shape, size, or even something unusual to our idea of life. The source or the controller of the response to our signals may itself be considered as meeting the definition of life. It is difficult to know what method would be appropriate to get a response from something considered "life in space" or something "extraterrestrial." We can see there are different creatures on our planet, which are using different kinds of signals or ways of communication. The way we are approaching the task of finding "life in space" may not be appropriate. There might be some specific process to communicate with extraterrestrial creatures. I think if we can find it, it would be possible to contact such extraterrestrial life in the universe (if they exist).

Normally, the public is always curious and sometimes scared about anything related to aliens. But the researchers and the government and private organisations, which are associated with the research on space sciences and extraterrestrial projects, must be able to protect the human civilization from any negative response or effect from outer space and extraterrestrial creatures.

If we are able to know about the origin of any animal or unusual type of extraterrestrial creatures, we will need to verify it through biological hypothesis and experimentation. Astrobiology is the advanced theory that researches and applies knowledge about the nature of space and planets to the possible structures of life. Thus, astrobiology is the perfect way to learn and explore about space-oriented biological research and applications.

SETI, the Search for Extraterrestrial Intelligence, and astrobiology are co-related endeavours. SETI is the astro-biological application of searching for life or for extraterrestrial life. So, astrobiology can be explored by the way of SETI activities. The first SETI search was conducted in 1960 by radio astronomer Frank Drake, using the 85-foot radio antenna of the National Radio Astronomy Observatory. Drake turned the giant radio dish to listen to two stars like the Sun, named Tau Ceti and Epsilon Eridani, both about eleven light years away, near enough that any signals should be easily detected. He observed the two stars intermittently from April through July, 1960, but no "intelligent" signals were detected. Drake's experiment did, however, inspire other astronomers around the world to search for "intelligent" signals from other stars. SETI also performs messaging to extraterrestrial intelligence (METI); it consists of sending signals into space in the hope that they will be picked up by an alien intelligence.

The great physicist Stephen Hawking, in his book, *A Brief History of Time*, suggests that

The Search for Life . . . (cont.)

"alerting" extraterrestrial intelligences to our existence is foolhardy, citing mankind's history of treating his fellow man harshly in meetings of civilizations with a significant technology gap. He suggests, in view of this history, that we "lay low." Another possibility is that aliens are using lasers to communicate with other planets' creatures. An alien could target an incredibly powerful laser at any star (or maybe ours); it would be detectable with large optical telescopes. Laser communication is one of the most powerful ways to search for ET, and scientists are searching for these alien signals at the same time we are searching for extra-solar planets.

Astronomy, astrobiology, space engineering, and their applications are related to each other. All these are different aspects to exploring outer-space activities. This is the time for all private and government research organisations to make a combined step towards the future of space exploration. Normally, people who have an interest in the future try to know about such different topics related to aerospace applications. Now, few businessmen are interested to invest in aerospace missions. Space exploration is very expensive and a hard process. It would be nice if more people could be a part of such different activities about space exploration and make a way to develop crowd funding for the security and existence of our future generation.

There might be many planets, such as Kepler 186f, which could have a similar atmosphere as Earth. Humans have started thinking about life beyond Earth. If we can do more research on such space exploration and utilize different ways to conduct SETI, in the near future, we could be successful.

The Otherness Singularity: It's Not the Big Brother Era Coming, But Rather the Big Other One

"Stars are so many suns, every one of which lights a world"

- Fontenelle

Patrice Bué

Member

Société Astronomique de France

Each human being has the impression that his life is not only important, but also very specific, and the period he lives in is unique. But what if this period was really a striking one, contributing to a paradigm change that could only occur once for the happy few years we have? We had, in the past, the roundness of the earth that carved the metaphysic world between science and spirituality. As Galileo stated, "The Bible shows the way to go to heaven, not the way the heavens go." It seems that we are facing a singularity in human history -- what I have called the "Otherness Singularity"-- or, in other words, the collective existential *hapax,* that unique, unforeseeable, and unrepeatable moment, when sentient beings discover that they are not alone in the cosmos. This singularity is contemporaneous with a few others, which are critical for the future of humanity and triggers,

depending on the way we are going to tackle them, the signal box to keep the train of humanity on the right track or to select the dead-end one.

Conjunction of Singularities

The specific feature of our age is a congruence of singularities in the next one or two generations (25 to 50 years). This situation occurs at a critical point in our history, a period when human beings who, through the development of science and technology, are facing challenges that will dramatically change our future. With exponential effects and in unpredictable ways, this will happen- not in one hundred years' time, but now. These changes are the conjunction of the following singularities:

- The *demographic singularity* called the "population bomb" in 1968 by Paul R. Ehrlich. Today we are more than 7 billion people.
- The *ecological singularity* seen both in the growing pressures on the environment for global food supplies, energy resources and raw material, and in their ecological counterparts (pollution, changes in atmosphere and ocean levels of CO2, alterations in atmosphere and ocean circulation and stratification, etc.), leading to disastrous anthropogenic effect. This singularity directly affects our planet's boundaries. [1]
- The *technological singularity* illustrated with the emblematic Ray Kurzweil book, *The Singularity is Near: When Humans Transcend Biology*, celebrating the "age of intelligent machines" but which is, in fact, only the tip of the iceberg. With their huge impact, technology and machines could drastically change our environment into a non-human control area, forcing us to innovate ever more sophisticated solutions, and introducing into the environment completely new, unknown risks getting asymptotically closer to a risk barrier. [2]

The Occultation of Reason

At the same time, the development of technology and science in astronomy and aerospace fields provide us with a new insight into a cosmos populated with an incredible diversity of objects, interactions, and phenomena driving us to be conscious of how beautiful and fragile our planet Earth is, surrounded by a huge dynamic universe full of risks and hazards. This crystallization, changing man's mind like a Stendhal interpretation, occurred first among the astronauts who got the chance to leave cradle Earth, discovering the stars in an overwhelming epiphany. [3] They are now the ambassadors of these new realms with the difficult task of sharing with humankind the ineffable.

At the same time, mankind is lost in down-to-earth issues, challenged by diversity with a heterogeneous patchwork of religions, technology levels, cultures, societies, and temporalities ranging from hunter gatherer societies, Medieval behaviours, and twenty-first century technology and weapons. In this mess, where each group wants to take the lead, reason seems to disappear in favour of the killing entropy driving us to the dark night. And there's not a totalitarian singleton

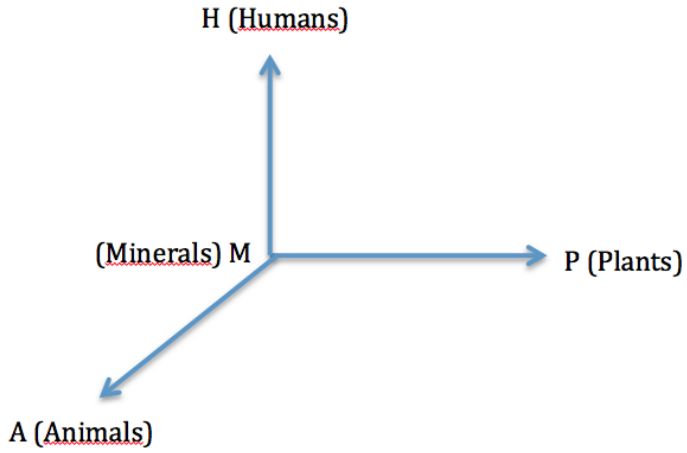
The Otherness Singularity . . . (cont.)

that could offer us a potential option to stay alive. [4]

Will our phenomenal diversity, not only in humankind but also in the full biosphere, bring us the elements to overcome this difficult period? What makes Earth so special is perhaps not the fact that it harbours intelligent life, but rather that Earth is a place showing a fabulous diversity, not only among human beings and cultures, but also in the biological species, a heterogeneity shaped by plate tectonics. Maybe other planets benefit instead from a peaceful environment driving them to homogeneous life forms, culture, society, and, finally, civilisation, conditions necessary to successfully manage the singularities' conjunction.

Emergence of a New Concept

The discovery of the first exoplanet in 1995 has driven a revolution in our understanding of the cosmos we live in. Earth does not seem unique and the prolific search for exoplanets with high-precision astrometry brings with it revelations of numerous Earth candidates to tackle our loneliness. So the "Otherness" perspective, hidden in the haystack of planets and stars, plays, according to the Copernicus principle, as a singularity, a trigger to encompass a totally new approach in "the mode of being in the world," solving the singularities' conjunction. The Otherness Singularity functions as an exoteric developing bath, a map showing us the way in the craggy road of mankind's future. We are not alone and others have gone over the kind of singularities we are facing. In his fabulous *Manhood of Humanity*, the visionary Alfred Korzybski identified the different classes of life according their interactions with their environment. [5] He represented the different classes of life in three life coordinates. Minerals, with their inorganic activities, would be the zero dimension of "life" or point *M*; plants with their autonomous growth and chemistry-binding class of life, would be the line *MP*. Animals, with their "autonomous" capacity to grow and to be active in space (space-binding class of life) would be the plane *PAM*; and humans, with their "autonomous" capacity to be active in space *and time* (time-binding class of life), are represented by the space *MAPH*.



Following Korzybski's logic, you could imagine a fourth dimensional area where mankind's collective mind would be active in the mode of "being in the world" through ethics and

The Otherness Singularity . . . (cont.)

spirituality (the ethical/spiritual-binding class of life). This capacity will counterbalance the hypertelic, or over-development of science and technology, to keep mankind on track to avoid the entropic abysses and the "paths of emptiness."[6] So, instead of separating science and spirituality/ethics [7] as two unconnected sets, the purpose would be to intermingle those domains in one nexialist [8] area equipped with a new non-classical logic [9] inspired by the Catuskoti one. We can be sure that with this new syncretic kind of science, which I have called *sciencality* or *spirience* (or ***X****pirience*), we will be well equipped to face this challenging period. Taking into account our marvellous cultural and human diversity as an opportunity to understand our Earth otherness, we, in some way, prepare a potential contact with the star Otherness.

Notes

1. Mark Lynas. "The Nine Planetary Boundaries: Finessing the Anthropocene". Online seminar, March 6, 2012, http://longnow.org/seminars/02012/mar/06/nine-planetary-boundaries-finessing-anthropocene/;

Mark Lynas. "Planetary Boundaries: Exploring the Safe Operating Space for Humanity". *Ecology and Society*. Vol 14, No 2-Art.32.

2. Sander Van der Leeuw. *The Archaeology of Innovation*. San Francisco, CA: Cowell Theatre, Nov. 18, 2009. http://library.fora.tv/fora/fora_transcript_pdf.php?cid=11292

3. Stendhal. "De la naissance de l'amour". In *De l'amour*, 1822, Chapter 2, p. 31.

Ce que j'appelle cristallisation, c'est l'opération de l'esprit, qui tire de tout ce qui se présente la découverte que l'objet aimé a de nouvelles perfections. Translated as, "What I call crystallization, it is the operation of the mind, which takes everything that comes, the discovery that the beloved object has new perfections." Here, by analogy, the loved person is the Earth.

4. Nick Bostrom. "What is a Singleton?" *Linguistic and Philosophical Investigations*, Vol. 5, No. 2 (2006): pp. 48-54. http://www.nickbostrom.com/fut/singleton.html

5. Alfred Korzybski. *Manhood of Humanity*. Second Edition, Chapter III, "Classes of Life," pp. 46-65.

6. Robert Jaulin. *Les chemins du vide*. Paris: Christian Bourgois, 1977. Chapter II "Economie et morbidité," pp. 91-147.

7. Edward Westermarck. *L'origine et le développement des idées morales*. Paris: Payot, 1929. Vol 2 : Chapter LIII, "Conclusions," pp. 719-728.

8. Concept developed by science fiction author A.E.Van Vogt in *The Voyage of the Space Beagle*, 1950. At the start of Chapter 7: "Nexialism is the science of joining in an orderly fashion the knowledge of one field of learning with that of other fields."

9. Graham Priest. "Four Corners-East and West. In *Logic and Its Applications*, Proceedings of the 4th Indian Conference, ICLA 2011, Delhi, India, January 5-11, 2011. *Lecture Notes in Computer Science*, Vol 6521, 2011, pp 12-18.

Thoughts & Opinions

Keirsten E. Snover

Medical Anthropologist

Access to Resources in Astrobiology: A Consideration for Astrobiology Outreach

Just recently, I was riding public transit with my son and we were passing by the NASA Glenn Research Center. Suddenly, my son practically jumped out of his seat, pointed out the window, and excitedly exclaimed, "There's NASA! There's NASA!" He then turned to me, and said (rather loudly), "Remember that time when you drove into the restricted area? Do you remember that, Mom? Do you?" Everyone on the bus turned to look at me. I was a little embarrassed. (The incident was simply a small misunderstanding when the Visitor's Center was still located on the NASA campus. My children still think that visit was the best one!) However, my embarrassment turned to momentary surprise when a person seated nearby leaned over and politely asked, "What's NASA?" I was caught off guard, so I stated what the acronym stood for and then said a few sentences about space exploration and the ISS. The person had never heard of NASA and was not aware of the existence of the ISS.

This encounter left quite an impression on me. Between living in such close proximity to a NASA facility, watching *Star Trek* re-runs, and connecting with the space community on Twitter, I tend to surround myself with so much space-related stuff that I can quickly forget that this may not be the experience of others. In this particular instance, I don't know why the person had no prior knowledge of NASA or the ISS. However, while this is a single story of a single person, this is not a completely isolated incident. Over the past few years, I have had multiple conversations with multiple other people who have limited knowledge about NASA and space exploration. This has prompted me to consider a larger question involving access to resources, specifically, the general public's access to information in the space sciences.

Information, including that of the space sciences, is a resource. Access to this resource (as with other kinds of resources) is not always distributed equally within our society. This has implications for the development of outreach programs to prepare individuals and societies for significant discoveries in astrobiology. The creation of program content should include a consideration of the varying degrees of access to information in the space sciences that participants may have. Strategies to increase access to foundational information should be included, and opportunities for additional information made available as well.

In addition, the outreach programs developed in preparation for astrobiological discoveries also constitute a resource. Who will have access to these programs? Who will not? When implementing these programs, care should be taken to address issues of access as well. Even a program well designed from scientific and educational perspectives could have limited success if the target audience has difficulty accessing it, due to practical or social barriers (whether real or perceived). Factors that could potentially impact access to a program (such as socio-economic status) should be examined, and close attention given to the experiences of any marginalized populations.

Access to Resources in Astrobiology . . . (cont.)

In summary, access to resources is an important issue that should be addressed when formulating outreach programs relating to astrobiology. Information relating to the space sciences is a resource, as well as the astrobiology outreach program itself. However, not everyone in our society has equal access to resources. As a result, limited access to these astrobiology-related resources has implications for the development and implementation of astrobiology outreach programs. Collaboration among social scientists of various disciplines will be important to address this potential challenge, and help prepare people for significant discoveries in astrobiology.

Keirsten E. Snover is an anthropologist who recently began pursuing an interest in the implications of human space exploration and colonization, including ethical, social, and medical issues. She received a M.A. in Medical Anthropology from Case Western Reserve University and a M.A. in History & Anthropology from Eastern Washington University.

Coming Soon!

The Astrosociology Research Institute is proud to announce the upcoming release of the premier issue of its peer-reviewed online journal, The *Journal of Astrosociology*.

Preview Table of Contents

To receive your complimentary copy, please send your email address to

ktoerpe@astrosociology.org

The main purpose of the Astrosociology Research Institute (ARI) is to develop astrosociology as a multidisciplinary academic field consisting of the social and behavioral sciences, humanities, and the arts. - www.astrosociology.org

Social Dimensions of Studying Potential Signs of Extraterrestrial Intelligence

Philippe Ailleris

Founder

UAP Observations Reporting Scheme

Gazing up at the night sky has been a source of wonder since the beginning of time, a subtle mix of fear and an unstoppable need to question our origin and destiny. We question what might lie in the star-lit sky beyond the range of humankind's limited view and whether or not we are alone in the universe. During the last decades, scientists and the general public have come to the conclusion that extraterrestrial intelligence (ETI) may well be found throughout the universe. Since the major discovery in 1995 of the first exoplanet, numerous other worlds have been detected by astronomers, including some Earth-like planets orbiting within their stars' habitable zones where water-based life may exist. The existence of these "terrae incognita" raises the question of whether some might support extra-terrestrial life and the possibility of contact with a non-human civilisation.

Extraterrestrial Life Detection

At a workshop on the societal implications of astrobiology, Albert A. Harrison presented a table of four scenarios related to the detection of extraterrestrial life arranged along two axes.[1] One, expressing the complexity of the life form encountered (simple vs. complex) while the second, expressing its proximity to Earth (distal vs. proximal). The first two scenarios, called "Distant dust" and "Microbes," relate to the astrophysical detection of biosignatures or the discovery of fossils and single cell organisms. The other two scenarios refer to advanced extraterrestrial civilizations. "ET calling" represents the Search for Extra-Terrestrial Intelligence (SETI) scenario, while "Space Visitors" concerns finding evidence of ETI within our solar system.

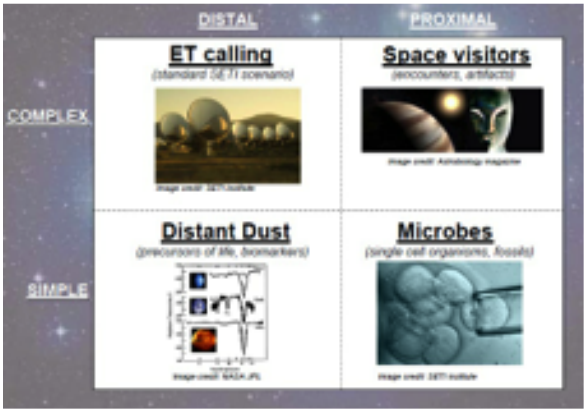


Figure 1: Illustration of detections scenarios based on the work of American psychologist Albert A. Harrison.

Local Encounters

Despite the fact that scientists have not yet discovered any sign of extraterrestrial life, public opinion polls regularly indicate not only a widespread belief in the existence of intelligent life in the universe, but also that some of it is already visiting us in the form popularly called Unidentified Flying Objects (UFOs). According to results from a 2012 *National Geographic* survey, about one-third of North Americans believe in the existence of UFOs. Since the mid-1940s, the UFO controversy has sparked the imagination of extraterrestrial life enthusiasts and invaded the modern consciousness on a worldwide scale. Despite the fact that the great majority of reports can be explained in conventional terms and the lack of acceptable physical evidence, a small core of events remain unexplained even after analysis. Such

UFO files contain more than brief sightings of mundane lights in the sky, including cases of radar detections, electronic equipment malfunctions, near-miss collisions with passenger airplanes, physical traces on the ground, and physiological effects on witnesses.

Social Dimensions

Whereas the scientific community generally considers the UFO topic pseudo-science and of little or no value to astrobiology, I would argue that if considered objectively, it has the potential to contribute to reflection on the societal aspects surrounding and arising from the discovery of extraterrestrial life. For decades, the UFO controversy has exerted influence on the fields of space exploration and the search for ETI, highlighting some common anthropocentric presuppositions and emphasizing societal issues related to the needs of scientific and governmental engagement, communication, and transparency.

Influences

In historical retrospect, the influence of the extraterrestrial hypothesis of UFOs is multifaceted. To start with, I believe that the public fascination with UFOs and the claims of close encounters creates social and psychological momentum from which space agencies may benefit and build upon. In fact, the UFOs topic could even be seen as providing unacknowledged support for the funding of projects focusing on exobiology and the search of exoplanets. UFOs reports excite the public about the potential for life in outer space, and that naturally can cause someone to agree with astronomical and other efforts to detect the conditions, and existence, of such life.

A second influence relates to the space agencies' communications policies. Because the UFO discourse is partially constructed around suspicion that governments hide the truth from the public, sensational claims abound in the field. Pictures taken by spacecraft are studied by the public for evidence of alien probes. Rather than refusing to answer public questions and therefore giving fuel to rumours and conspiracy theories, space agencies have realised that there is a need to be more transparent, responsive, and cautious with their outreach.

Discussion and consideration of the UFO phenomenon has also invited us to broaden our parochial horizons about other intelligences. It has stressed the need to be careful about potential biases and assumptions about ETI and their behaviour. For example, and to highlight only a couple of the more frequent claims: "if they were here, they would land in front of the public," or "they wouldn't act nonsensically." Regarding another intelligence, do we know how to study something that knows it is being studied, might not want to be studied, or might even be studying us in return? UFOs teach us that we need to be open minded in our research, as our anthropocentric biases and observational capabilities could limit our ability to detect and identify extraterrestrial life.

Regarding ETI searching methods, the UFO phenomenon has opened up a completely new dimension, not fully recognized by science. Since the 1950s, governments, associations, and researchers have launched various instrumented projects to demonstrate the physical reality of the

Social Dimensions of Studying Potential Signs of ETI . . . (cont.)

phenomena and potentially the presence on Earth of probes of extraterrestrial origin.[2] These field studies, still being developed nowadays across the world, have demonstrated the feasibility of applying the scientific method for studying UFOs.

An additional influence of the UFO phenomenon can be found in the alleged encounters of the third kind. Claims of direct observations of animate beings at close proximity to UFOs and abduction reports have created an image of what an alien should look like in the public mind. A little grey creature, with a big head, elongated eyes, and long arms. This "alien icon" has raised an interesting debate about biological convergent evolution. Would alien physiology conform with or be a close approximation of our own? Although many scientists systematically dismiss the anthropomorphic similarity of the described "UFOnauts" as pure fantasy, it appears that the debate is still open. Leading Paleobiologist Simon Conway Morris offered in 2010 a different perspective by stating that, in the end, the number of options is remarkably restrictive, and that extraterrestrials will most likely have evolved just like "earthlings."[3]

Figure 2: Project Starlight International (USA, Ray Stanford, 1973-1985)

Sixty years of ufology debate have accustomed us to the eventuality that we might discover or encounter ETI in the course of our interplanetary explorations. UFO reports clearly motivate the question of whether there really is life out there. This certainly constitutes a positive influence as it helps to psychologically prepare the public to the idea of discovering extraterrestrial life. At a time of fears regarding projects of broadcasting radio messages to potential alien civilizations,[4] the general public might have already taken note that UFO reports and the seeming non-interference of ETI in the affairs of Earth would implicitly argue that we have less to fear from eventual contact.

Undoubtedly, direct, convincing, and unequivocal evidence of the existence of ETI would be the greatest discovery in the history of mankind. However, there is much to be learned on the way toward this objective and the UFO phenomenon may well be a part of this path forward.

Figure 3: Alleged UFO landing trace, Delphos ring soil, Kansas, 1971

Social Dimensions of Studying Potential Signs of ETI . . . (cont.)

Notes

1. Albert A. Harrison. "Planning for contact: Fantasy documents or guideline for action". IAC-08-A4.2.6

2. Ailleris, P. (2011). "The lure of local SETI: Fifty years of field experiments". Acta Astronautica. Vol. 68, Issues 1–2, pp. 2–15.

3. Simon Conway Morris (2011). "Predicting what extra-terrestrials will be like: And preparing for the worst", Philosophical Transactions A, DOI: 10.1098/rsta.2010.0276, Published 10 January 2011.

4. http://www.bbc.com/news/science-environment-31442952

Philippe Ailleris is a project controller at the Space Research and Technology Centre of the European Space Agency, in the Netherlands. The UAP Observations Reporting Scheme Project, which aims at collecting UAP reports from the astronomical community, was undertaken as personal work. Any views expressed in this article are entirely his own and not those of the European Space Agency.

The Journal of Astrosociology

Volume 1, Issue 1 (2015)

Table of Contents

Jim Pass, PhD

CEO

Astrosociology Research Institute

Notes from the CEO

Social scientists, like Al Harrison, have made tremendous contributions to SETI from the very beginning of its inception. In fact, Dr. Frank Drake's famous equation includes social-scientific variables whose values make a huge difference in how one estimates the potential number of extraterrestrial civilizations in our galaxy. The participation of scientists and scholars from the social sciences and humanities has become even more important as astrosociology continues to develop, and astrosocial phenomena – the social, cultural, and behavioral patterns related to outer space – increasingly affect societies and their citizens. This particular issue continues the tradition of approaching SETI and astrobiology from a social-scientific perspective.

Of course, this newsletter continues to highlight important astrosociological issues based both as a result of scientific inquiry and on events in the news. Dr. Harrison contributed to our third issue and voiced his strong support for this newsletter and our other projects. His encouragement continues to be a driving force for ARI.

Looking to the Future

Other projects for 2015 include the imminent release of the first issue of *The Journal of Astrosociology*, which will be available for no cost on the astrosociology.org website. Those on our mailing list will receive a copy directly. This first issue includes a nice variety of astrosociological topics. A student chapter is included as well.

Anticipated for this summer is the publication and release of the first book by the Astrosociology Research Institute, titled *Launching Astrosociology*, which will define the field and highlight many of the astrosociology subfields. It will serve as a reader for Introduction of Astrosociology courses and others that touch on astrosociological issues that cover both STEM and social science materials. Important to this project is our focus on making this publication affordable, especially for students.

The "Astrosociology in the Classroom" program continues to advance in 2015 on a number of different fronts. Look for announcements on our website and in the social media. Astrosociology education and research remain the hallmarks of the Institute. As such, a major goal remains to facilitate the development of this field in large measure by helping others to participate. Bringing the two major branches of science together vis-à-vis space exploration, science, settlement, and travel, benefits everyone and their societies.

Look for a comprehensive website redesign in the coming months with a host of upgrades and new capabilities. We are transitioning our site into the twenty-first century for the benefit of our

Astrosociology Research Institute

Business Address: P.O. Box 1129
Huntington Beach, CA 92647

Jim Pass, Ph.D.

Chief Executive Officer
Email: jpass@astrosociology.org
Twitter: @astrosociology

Christopher Hearsey, M.S., J.D.

Chair, Board of Directors; Editor-in-Chief, Journal of Astrosociology
Email: chearsey@astrosociology.org
Twitter: @HearseyAstrosoc

Kathleen D. Toerpe, Ph.D.

Editor, Astrosociological Insights; Deputy Chief Executive Officer for Programs and Special Projects
Email: ktoerpe@astrosociology.org
Twitter: @ktoerpe

Katrina Jackson M.S.

Deputy Chief Executive Officer for Public Outreach and Education
Email: kjackson@astrosociology.org

Renato Rivera Rusca, M.A.

Deputy Chief Executive Officer for International Outreach and Education
Email: rrivera@astrosociology.org

Visit us on the web:
www.astrosociology.org

Archived Issues of Astrosociological Insights:
www.astrosociology.org/vlibrary.html#VL_Newsletter

Support ARI at smile.amazon.com

Notes from the CEO (cont.)

colleagues, future collaborators, and especially, students. It will become much more appealing to the eye. More importantly, however, our website will allow you to become more productive in a variety of different ways. If you have any suggestions, please pass them along to me (see my email address to the left).

Finally, the Institute plans to more strongly encourage collaborations with other individuals, groups, and organizations. One exciting example will be our student essay competition. Another major effort for the future is a student scholarship program. We intend to assist students interested in pursuing astrosociology in affording their efforts.

New events and announcements will follow as they arise. Contact our newsletter editor, Kathleen Toerpe, to stay on top of new occurrences by adding your name to our mailing list. We encourage social and behavioral scientists, humanists, artists, and STEM-based scientists and practitioners interested in how space relates to culture, society, and human behavior to sign up!

"Bringing the two major branches of science together vis-à-vis space exploration, science, settlement, and travel, benefits everyone and their societies. "

- Jim Pass