

JSP

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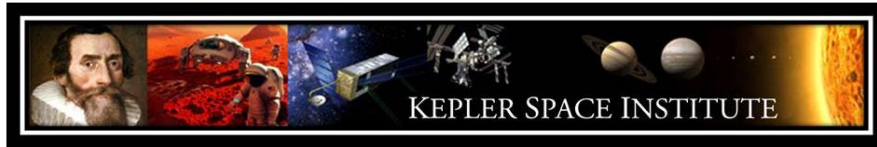
**"The Expansion of Civilization
Beyond Earth: A Moral Issue"
By Adriano Autino**

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**"METALAW: From Speculation to Humankind
Legal Posturing with Extraterrestrial Life"
By George S. Robinson**

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Kepler Space Institute

Meeting the needs for the future of humans on Earth, and in Space, with dreams and skills of global scholars

*Dedicated to the belief
that Space holds
solutions for the
betterment of humankind.*





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Preface

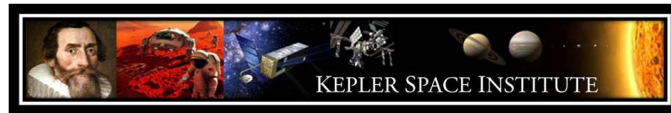
A major focus of this journal is the philosophy set out in Volume 1, Issue 1, namely that we should seek reverence for life within ethical civilization. Our first principle is that reverence for life is the foundational purpose that will sustain humankind in perpetuity. A number of articles in this Issue expound and expand upon this theme. In addition, one of our feature articles, by Marc van Duijn, includes a discussion prompted by the ideas it contains. The editors welcome such discussion, on both past and present articles, and all such contributions will be considered for publication in subsequent issues.

We are pleased to welcome two new members to our Board of Editors: Stephen Stephanou and Stephen Wolfe. We look forward to their contributions in the future.

This journal is peer-reviewed. Submissions, to BobKrone@aol.com, will be considered for publication from anyone on Earth or in Space. Views contained in articles are those of the authors; not necessarily reflecting policy of Kepler Space Institute. Reproduction and downloading of Journal content for educational purposes is permitted; but authors hold copyrights of their material and professional accreditation is required.



Bob Krone, PhD, Editor-in-Chief
Gordon Arthur, PhD, Associate Editor
Kseniya Khovanova-Rubicondo, PhD, Research Editor



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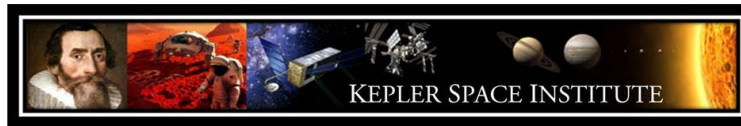
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Access to the Journal of Space Philosophy and downloading of its articles is available at www.keplerspaceuniversity.com. Anyone on Earth or in Space may submit his/her article to BobKrone@aol.com



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Press Release, September 24, 2013

Key to Intelligence Likely Universal

By Walter Putnam

Intelligent extraterrestrial life forms would most likely possess the same key to transforming sensory data into cognition as humans and other cognitive life here on Earth, a Dutch theorist writes in the next issue of *The Journal of Space Philosophy*.

The link lies in *recursive distinctioning*, a term applied to a “principle that underlies all perceptual and cognitive processes,” according to Dr. Marc van Duijn, a lecturer at the Faculty of Sciences at the Free University of Amsterdam.

In the third installment of Kepler Space Institute’s online philosophy journal, to appear October 1, van Duijn builds on the research and writing of Dr. Joel Isaacson, who wrote of recursive distinctioning as it applies to the concept of universal, or cosmic, intelligence in the first edition of *The Journal of Space Philosophy* in the Fall of 2012.

“What happens in RD is that an agent capable of spatial and/or temporal distinction-making makes local discriminations on raw proximal sensory inputs and subsequently uses this new pattern, made up of local distinctions, as an input for another round of distinction-making,” writes van Duijn, adding that the recursive process can be repeated indefinitely.

He notes that this and other principles of intelligence “can not only be used to come to a more coherent theoretical understanding of what natural cognition is as a biological phenomenon, but can also be used as biologically plausible constraints on thinking about the nature of extraterrestrial forms of intelligence.”

Van Duijn, who received his PhD in theoretical philosophy in 2012 at the University of Groningen, the Netherlands, concludes that more research is needed to prove that such principles are universal biological mechanisms.

But he writes that “the discovery of universal principles of biological cognition could help us go beyond mere speculation, so that we can come to a biologically plausible understanding of how intelligent life on other planets might have evolved.”

In another essay in the Fall 2013 *Journal*, Adriano Autino, co-founder and president of Space Renaissance International, argues that there is a moral imperative for humans to explore and develop extraterrestrial space.

Autino’s rationale, in an essay titled “The Expansion of Civilization Beyond Earth: A Moral Issue,” is that human civilization is so threatened that declining to advance as a species by expanding horizons beyond Earth would be tantamount to suicide.

Rejecting proponents of “de-growth” as a means of curbing human consumption and ravaging of the global environment, Autino writes that resources of space are “virtually endless and can cover human needs for several millennia to come.”

“Therefore, while the modern Savonarolas advocate a season of thrift and *wise administration of misery*, we should learn to handle the large abundance and freedom that we will find in space,” concludes Autino, an Italian entrepreneur in information technology and automation.

The essays by Autino and van Duijn are among the 10 articles in the fall issue of the *Journal*, the brainchild of KSI Provost Bob Krone.

“Our mission for both *The Journal of Space Philosophy* and Kepler Space Institute includes contributing to research holding potential for improving the capability, the affordability, the efficiency and the effectiveness of space exploration, development or human settlements,” Krone said. “In this issue we feature research into intelligence.”

Other articles in the upcoming *Journal* include “Utopia: Philosophy and Reality,” by Dr. Krone; “Deep Space III: The Human Space Program,” by Frank White; and “METALAW: From Speculation to HumanKind – Legal Posturing with Extraterrestrial Life,” by George S. Robinson.

Also presented are: “Asteroid Mining – The Low Hanging Fruit of Space Abundance,” by KSI President Robert Frantz and Michael Buet; “Space Business and Management,” by Thomas H. Olson; “Philosophy for Humans in Space” by Bob Krone; and “Bigger and Hotter Rockets and their Consequences,” by William Mook.

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About Kepler Space Institute and University

By Robert L. Frantz, President, Kepler Space Institute

The vision for a United States Space University has been held by thousands of Space professionals and educators for decades. We are now moving forward towards our vision with the incorporation of Kepler Space Institute, Inc. in the state of Florida. Our next step will be to register with the Florida Department of Higher Education, after which we can assume our new name as Kepler Space University. Along with board member Walter Putnam, who has set up temporary living in Titusville, Florida, we have scouted potential sites for our new office. We will likely be within a five-minute drive of the Kennedy Space Center's main gate. We continue to operate Kepler Space Institute in South Carolina as a nonprofit and the center for our space development think tank.

Kepler Space Institute/University is committed to direct its efforts, resources, qualifications, and talents to endeavors that benefit humanity now and in the future. Our KSI leadership formulated the *Law of Space Abundance* in 2009, defined as "*Space offers abundant resources for humanity's needs.*" It was a logical law flowing from research and discoveries over centuries. We seek to guide people, groups, businesses, agencies, and international organizations to achieve new goals and visions facilitated by the material and spiritual resources that await us in Space. To this end, we have recently collaborated on an academic paper for asteroid mining moving us from words to deeds.

Our Kepler Team, which collectively has spent one thousand work years within the Space Community, is proud to be continuing the world's first *Journal of Space Philosophy* with this Fall 2013 issue. We invite global Space professionals and enthusiasts to subscribe to the Journal on our website, www.keplerspaceuniversity.com. There is no charge and we encourage global comments on our blog dedicated to the Journal, regarding the streams of intelligence you will find and on our proposed KSI Space Philosophy, "*Reverence for Life Within Ethical Civilization*" provided by our Provost, Dr. Bob Krone.

We are proud to use the name Kepler in recognition of Johannes Kepler, whose mathematical genius in defining our solar system remains a legacy today in the studies of orbital mechanics in aerospace education around the world. *The Journal of Space Philosophy* represents a new renaissance era in the spirit of Johannes Kepler, which will be the incubator in space development for both Earth's benefits and for humankind's survival.



This is where we will build a second Kepler office in the virtual world. We can also practice building here. The actual spaceship designs will be done above in the Starship Kepler now in virtual low earth orbit. The ship will initially have only a thin skin structure. Then it will be moved to a stabilized position at an Earth/Moon Lagrange Point. Here mined materials will be brought up on the space elevator tether first to have our robotically-run 3D printers print plates for inside the skin to provide deep space radiation protection. Once protected, human contractors can be sent up to complete the ship's infrastructure, again using 3D printers. The ship will spin slowly, as Von Braun envisioned, for artificial gravity.

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About the Author: Robert “Bob” Frantz’s first career was as a United States Marine Corps Fighter Pilot. His flying achievements and Vietnam War combat decorations led to his Chairman of the Board position in America’s Distinguished Flying Cross Society. His second flying career was as a commercial airlines Captain flying the globe with United Airlines. Between flights, he earned the University of Southern California’s Master of Science in Systems Management Degree Program, which launched him into the field of Education. He became an expert in the technology of online education, which he has applied to Ashburn University and Kepler Space Institute; he earned the PhD in Earth and Space Sciences. As this *Journal of Space Philosophy* is published online he is teaching, consulting and strategic planning for the future of Kepler Space University.



Editor's Notes: Kepler Space Institute and University (KSI & KSU) have been blessed throughout their short existence by the volunteer work of talented entrepreneurs with extensive experience in the Space Community. When our Founding President, Dr. Richard Kirby, died at the height of his intellectual productivity, on September 24, 2009, our group of Kepler leaders turned to Robert L. Frantz, who had all the qualifications needed to become President. He said "Yes" (no salary was available) and has brought KSI to operational status and supervised KSU planning ever since. *Bob Krone, PhD.*

Letters to the Editor

1. From Ms. Nancy Pearlman
2. From Mr. Steven Wolfe

Space Potential for Earth's Environment

Dear Editor,

When growing up, I kept hearing how the oceans of the world were so vast and bountiful that they could sustain us forever. There was supposed to be enough food, minerals, and even potential habitat (if artificially made) for human settlement. However, since the 1970s' environmental movement, we have learned that the oceans are very threatened with pollution, noise, over-exploitation, and other human misuses and abuses.

People believed that fresh water would never be scarce because we could always turn to the ocean, which covers 71% of the Earth's surface and contains 91% of the planet's water. But later we realized that desalinization is neither cost-effective nor eco-friendly. Most fish are depleted due to overfishing. The "garbage patch" with plastics and other materials that do not biodegrade is covering a massive area in both the Atlantic and the Pacific. And the list goes on. Homo sapiens must be better stewards of the earth and treat space with equal respect.

On Earth there is not now enough food, water, and shelter for everyone. Forecasts are bleak. Energy is scarce and the cause of huge global problems. The carbon footprint of Americans and many others in the developed world is causing climate change. Climate change in turn has caused problems, with more severe cases predicted. Animals are starving to death because of inability to feed (such as the polar bears) and temperatures are rising, so that agriculture and polar ice are being affected.

I have devoted forty years to the study and communications of Earth's ecosystems decline. Becoming aware of the existence and potential of Space meeting the needs of Earth's people has been an exciting learning process for me after a long period of observing increasing shortages with increasing problems here on Earth. Dr. Bob Krone and I have been friends for five decades due to his parents and mine joining forces to found the Idyllwild School of Music and the Arts in the San Jacinto Mountains East of Los Angeles and West of Palm Springs. Reading Bob's edited *Journal of Space Philosophy*, which he founded just last year, reminds me of the exhilarating times I experienced hiking the outdoors around the world. The history, science, technology, and philosophy contained in the first three issues of this Journal give me hope that there are solutions for the chronic problems on Earth – and that Space is the source of those solutions.

Readers will discover those solutions for themselves; but they all fall under *THE LAW OF SPACE ABUNDANCE* that the leadership of the Kepler Space Institute formulated in 2009. It states: “*Space offers abundant resources to meet human needs.*” Communications have been my profession, so I was aware of the tremendous advances Space systems have created for global communications. I was not aware that science and technology has actually produced demonstrations of space-based solar powered systems that will make the energy of the sun available everywhere on Earth. Solving Earth’s energy needs will also solve so many of Earth’s other ecosystems problems, which I have covered in my radio and television series. And I have learned that the transition from all-government Space sponsorship to private business over the past fifteen years means that the future of humans in Space has moved from fiction and theory to feasible science and technology programs, which have begun since the year 2000 and will blossom this decade over the next decade. Mining asteroids may be the first huge industry from Space. Space tourism has begun. The increasing amount of trash in Space now has companies ready to solve that problem. And human Space settlements are being designed by engineers and students in many nations. Even more exciting are the studies that describe the probability of international cooperation to achieve Space exploration, development, and settlements, leading to new government and decision-making models that will be able to transfer peaceful advances in Space to the resolution of conflicts and wars on Earth.

Over twenty years ago I had little concept of what Space resources could do to solve the World’s environmental crises. Now my pessimism has turned to optimism. I hope to publish in my 2025 *THE COMPENDIUM NEWSLETTER* issue “*How Space has Saved the Earth.*”

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About Nancy Pearlman. Ms. Pearlman is an award-winning broadcaster, environmentalist, college instructor, anthropologist, editor, producer, on-air personality, and outdoorswoman who has made safeguarding the Earth’s ecosystems both a vocation and an avocation. Nancy founded the Ecology Center of Southern California in 1972; Project Ecotourism in 1993; Humanity and the Planet in 2001; Earth Cultures in 2004; and Nancy Pearlman, Eco-Traveler in 2007. She has over 2,000 radio broadcasts of her Environmental Directions radio series. She is Executive Producer and host of the three-time EMMY-nominated environmental television series ECONews and has created over 600 video documentaries. Nancy Pearlman has been an elected member of the Los Angeles Community College District Board of Trustees since 2001. Her athletic achievements include completing the Western States 100-mile run, finishing the Ironman Triathlon, climbing more than 100 listed peaks in California, winning long-distance races such as the 1980 Regional Championship 50-mile race, and performing in equestrian events.



Editor's Postscript. It's a special pleasure for me to publish this letter from Nancy Pearlman. We have been personal and professional friends since the late 1950s due to the friendship of our parents since we were youths. Nancy is a dynamic and productive professional who will be a contributor to future issues of the *Journal of Space Philosophy*. *Bob Krone.*

STEVEN M. WOLFE

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September 23, 2013

Dear Bob Krone:

Congratulations and thank you for creating the *Journal of Space Philosophy* (JSP). The articles I've read exhibit a deep contemplation on the essential imperative that human life expand beyond this planet. This dimension of the space experience is too often lost in programmatic and political discourse. You are providing a singularly refreshing place for readers looking for deeper meaning in space exploration.

As you know, I recently published a book, *The Obligation*, that I hope contributes to this vital dialogue about the space settlement imperative and your *Law of Space Abundance*. In my work, I theorize that humankind emerged from the animal kingdom, with all of his unique faculties, for the very explicit purpose of being the *agent* species to carry the seeds of life from this planet to other parts in the universe.

This can be a divisive claim, even among strong space advocates (as I have discovered from some of my readers). So, let me break it down a little. When someone says that space exploration is "in our DNA," in most cases they say so by default because there isn't any other clear cut way to explain the human drive to rocket to other worlds. We have an urge to explore the heavens, but we can't say exactly why that is. So, we revert to a somewhat simplistic explanation that such urges are *part of who we are*—that's all. Those of us who feel this same motivation nod in agreement. We need no other reason.

The Obligation is an attempt to say that in fact space exploration *is* in our DNA. And while we cannot point to the specific *space gene* just yet, we can, like Darwin, analyze

the patterns in the evolution of civilization for strong clues, if not proof, that such a space gene exists. *The Obligation* invites readers to examine the patterns of human behavior from the moment we left *the Garden* to our ascendance to total global dominance. If we look at the march of human history from the right perspective we see that our progression has always been leading us to one thing more than any other: the expansion of life from this world.

Without us, space travel is not possible. With us it is inevitable. We did not randomly evolve our way to the brink of multi-planetary existence. We have been unconsciously moving in the spacefaring direction since our earliest days, prompted by a process that we cannot yet fully understand.

Our long history of social and technological evolution, I argue, was a *developmental* process that allowed us to obtain the wherewithal to construct the ships, or seedpods, to send the seeds of life out into the cosmos. Whatever else we have achieved or may yet become in pursuit of our own actualization, the human family also serves in an essential role in a universal process much bigger than ourselves.

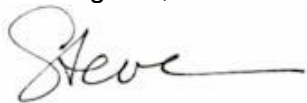
I believe that placing space exploration and settlement in such a broad context can help to ease our transition to a multi-planetary species. I think it is essential that we, as a global culture, reach a point in our collective understanding that human expansion into space is simply part of who we are as a species—not figuratively, but literally. Once this sense of an *Obligation* can be broadly accepted, the way forward will be much smoother for the engineers and designers, governments and entrepreneurs.

In the search for a meaningful *philosophy of space*, we are looking for a thesis that explains the “rightness” of human space endeavors beyond a shadow of a doubt. There are, I suspect, many ways of explaining that rightness. Again, I hope that my work constructively adds to that exploration.

In an upcoming issue of JSP, I will provide a detailed summary of the tenets contained in *The Obligation*. I wrote *The Obligation* as a work of fiction with the intention of making the philosophical content more accessible to a wide audience. In the non-fiction treatment, I look forward to adding a bit more scholarship meat to the theory.

Again, congratulations on the *Journal of Space Philosophy*. I also wish to thank you for inviting me to serve on the JSP Board of Editors. I look forward to participating.

Best regards,

A handwritten signature in black ink that reads "Steve" followed by a long, horizontal flourish.

Steven M .Wolfe

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About the Author: Steven Wolfe has been a writer, speaker, and advocate for the advancement of the space settlement concepts and related ideas for more than 25 years. He was a legislative aide for the late Congressman George E. Brown, Jr., where he served as executive director of Congressional Space Caucus. He served on the board of directors of the National Space Society, president of the New York Space Frontier Society, and Advocate of the Space Frontier Foundation. Steve drafted the Space Settlement Act of 1988 for Cong. Brown. The bill was signed into law by President Ronald Reagan as part of the NASA Authorization bill. Steven is currently a consultant in the solar energy industry. His bio can be found at <http://theobligationbook.com/author.html>.



Editors' Postscript: Steven Wolfe is a welcome addition to our Board of Editors beginning with this Fall 2013 issue of *The Journal of Space Philosophy*. The conversion of fiction to reality is an increasing phenomenon in the Space Age. When the author has solid Space knowledge combined with long experience with government decision clusters, as Steve Wolfe does, the probabilities of his thinking becoming reality are good. His messages in *The Obligation* resonate with much of the philosophy and vision readers will find in our Journal related to Space exploration and human Space settlements. His fundamental theme that we on Earth have an obligation to explore and settle for the benefit, even survival, of humankind everywhere supports *The Law of Space Abundance* formulated by Kepler Space Institute leadership in 2009 which reads: "Space offers abundant resources for human needs." We believe his writings can change the thinking of Space pessimists and reinforce the thinking of those who have always believed that Space has solutions for many chronic problems on Earth. We look forward to his forthcoming article in the Spring 2014 issue of the JSP. *Bob Krone and Gordon Arthur*.

Universal Principles of Biological Cognition

By Marc van Duijn, Ph.D.

Distinction-making or discrimination is a fundamental aspect of sensation and perception. Several classical psychophysical laws such as Weber's law and Gestalt principles are based on our ability to make distinctions in sensory input. In the first issue of *JSP*, Joel Isaacson¹ introduced the notion of *Recursive Distinctioning* (henceforth RD) as a natural law that applies to all naturally evolved cognitive agents. According to Isaacson, RD is a universal principle that underlies all perceptual and cognitive processes. What happens in RD is that an agent capable of spatial and/or temporal distinction-making makes local discriminations on raw proximal sensory inputs and subsequently uses this new pattern, made up of local distinctions, as an input for another round of distinction-making. This process can in principle be repeated indefinitely; hence the recursive nature of RD.

The identification of this and other universal principles of intelligence can not only be used to come to a more coherent theoretical understanding of what natural cognition is as a biological phenomenon, but can also be used as biologically plausible constraints on thinking about the nature of extraterrestrial forms of intelligence. That is, the identification of such universal principles of cognition could be used to form a biologically plausible picture of the organization of intelligent extraterrestrial organisms; these principles would have to hold for the perhaps to be discovered (micro)organisms in, say, the oceans of Jupiter's moon Europa, or other intelligent life forms on exoplanets.

As a theorist working on biological cognition, I am interested in general principles of biological cognitive organization, which is why I was drawn to Isaacson's RD hypothesis. In my dissertation, I develop a modern theoretical framework for understanding biological cognition that incorporates similar universal principles of biological cognition. There is a growing need for such a modern, revised framework because of the paradigm shift that is currently taking place in modern-day cognitive science.

This paradigm shift is fundamentally changing the way in which many cognitive (neuro)scientists and philosophers have come to define what constitutes a cognitive system. Since roughly the mid-1950s, the received view holds that cognition boils down to computation or symbol manipulation. On this view, cognition is shared by digital computers and organisms with advanced brains capable of symbolic representation. Since the early 90s, however, a competing paradigm of cognition has emerged and scholars from various disciplines have increasingly argued against a purely computational view of cognition.^{2,3} Although there is still no strict consensus on the status and the contents of the new paradigm, three main theoretical changes are

¹ J. D. Isaacson, "Nature's Cosmic Intelligence," *Journal of Space Philosophy* 1, no. 1 (2012): 9.

² H. Dreyfus, *What Computers Still Can't Do* (New York: MIT Press, 1992).

³ R. Penrose, *The Emperor's New Mind* (Oxford: Oxford University Press, 1989).

prominent with respect to the classical view. These three major theoretical changes are rooted in ideas that have circulated within the cognitive sciences for a long time and now seem to re-surface partly because of new empirical evidence that vindicates these views:

(1) Cognitive science seems to be converging towards a more embedded and embodied view of cognition by also incorporating morphological, biomechanical, situational, and dynamical factors in the study of cognition. On this view, cognition is not so much a brain-bounded computational process, but rather involves the co-evolution of neuronal variables, bodily variables, and environmental parameters: cognitive systems are viewed as dynamic brain-body-environment systems that are not necessarily fully understood as computational systems.⁴ This approach also stresses the importance of perception-action coupling in the study of cognition: the different ways in which organisms adaptively coordinate perception and action is thought to be constitutive of cognition.

(2) There is a strong shift from linguistic-, logic-, and computer-based approaches to cognition to more biologically oriented bottom-up explanations of cognition. These approaches assume that biological cognition is first and foremost a biological property that first evolved in comparatively simple organisms. On this so-called biogenic view,⁵ natural cognition is a form of adaptation that confers certain selective advantages for organisms, such as allowing them to cope more efficiently with environmental complexity.⁶ Typically human cognitive skills such as thinking and reasoning are very advanced cognitive capabilities and these highly advanced skills probably do not provide a suitable theoretical starting-point for understanding the evolutionary origins and biological functions that biological cognition serves. Biogenic approaches aim to gain more headway on answering fundamental questions regarding the relationship between life and cognition as adaptive mechanisms, by attempting to specify better which adaptive functions cognition serves and to investigate how more basic forms of biological cognition are related to more advanced human-like forms of cognition.

(3) The common *brain-based* view of cognition asserts that the evolution of cognition advances with the evolution of the brain or that it coincides with some more advanced stage in brain evolution. On this brain-based view, cognition is a property that developed relatively late in evolution and is associated with typically human cognitive skills such as abstraction, symbolization, and language. The brain-based view is contested by empirical research from a variety of disciplines, as there is convincing evidence for cognitive-like abilities in single-celled organisms.⁷ The complexity of the

⁴ R. D. Beer, "The Dynamics of Brain-Body-Environment Systems: A Status Report," in P. Calvo and A. Gomila, eds., *Handbook of Cognitive Science: An Embodied Approach* (Amsterdam: Elsevier, 2008), 99-120.

⁵ P. Lyon, "The Agent in the Organism: Toward a Biogenic Theory of Cognition," PhD thesis, Australian National University, Canberra, 2006.

⁶ P. Godfrey-Smith, *Complexity and the Function of Mind in Nature* (Cambridge: Cambridge University Press, 1996).

⁷ E. Ben Jacob, I. Becker, Y. Aspira, and H. Levine, "Bacterial Linguistic Communication and Social Intelligence," *Trends in Microbiology* 12 (2004): 366-72.

behavior of unicellular organisms has long been underestimated by behavioral scientists. However, recent microbiological evidence shows that single-celled organisms already exhibit complex capabilities that are often presumed to be cognitive, like memory, learning, and action-selection. The idea that single-celled organisms are already capable of cognitive-like behaviors suggests that what we call biological cognition represents a phylogenetically ancient adaptive process that evolved long before nervous systems did.

The framework for biological cognition I develop in my dissertation⁸ is based on these aforementioned theoretical developments and is an attempt to integrate them into a coherent framework. The thesis is based on the assumption that sensorimotor coordination (SMC) is a necessary and sufficient feature of biological cognition. The notion of SMC is rooted in the work of John Dewey, whose work forms the foundation of the embedded/embodied approach to cognition. Dewey claimed that perception is not passive and stimulus-driven, but that it is fundamentally action-based; perception is a way of acting that involves SMC. By performing motor actions, organisms partially determine the sensory changes they perceive. Self-induced movements can therefore generate law-like patterns in sensory-information, which simplifies learning and facilitates cognitive processes⁹.

SMC is ubiquitous in the animal kingdom and is also exhibited by organisms without a brain or central nervous system. For example, bacterial chemotaxis is a form of SMC that provides a good example of *minimal cognition*, the most elementary form of biological cognition.¹⁰ By detecting and moving along gradients of chemicals, bacteria such as *E. coli* are able to self-optimize the conditions of their external physico-chemical environment for the benefit of their metabolic functions. By way of temporal comparison, using a form of memory that can last from seconds to several minutes, bacteria such as *E. coli* are able to detect extremely subtle changes in gradients of many superimposed chemicals and to travel up or down these gradients by alternating between running and tumbling behaviors in order to obtain nutrients or to avoid toxins or other harmful circumstances.

The two-component signal transduction system, or TCST, is a molecular sensorimotor mechanism that also operates as a molecular form of memory required for bacterial chemotaxis. The TCST system is made up out of two separate but interacting “branches” or signaling pathways: one that mediates perception, the phosphotransferase or perception pathway, and one that mediates adaptation by providing feedback on the bacterium’s receptors, the methylation pathway. The interaction between the fast-paced perception pathway, which operates at the level of milliseconds, and the slower-paced methylation pathway, which functions on the level of seconds, up to minutes, gives rise to intricate feedback cycles between the two

⁸ M. van Duijn, “The Biocognitive Spectrum – Biological Cognition as Variations on Sensorimotor Coordination,” PhD thesis, RijksUniversiteit Groningen, 2011.

⁹ R. Pfeifer and C. Scheier, *Understanding Intelligence* (London: MIT Press, 1999).

¹⁰ M. van Duijn, F. A. Keijzer, and D. Franken, “Principles of Minimal Cognition: Casting Cognition as Sensorimotor Coordination,” *Adaptive Behavior* 14, no. 2 (2006): 157-70.

pathways¹¹. Due to the interaction of both pathways on different time scales, the methylation level of the receptors is “compared” to the level of attractor and repellent occupancy at the receptors, which biases their motor responses and ultimately allows the bacterium to engage in SMC.

The key role of sensorimotor behavior in the development of human cognition was emphasized by Piaget and Vygotsky, who both claimed that the first two years of human development are entirely devoted to SMC and that the development of reasoning skills crucially depends on early sensorimotor stages. Recent research dovetails with the view that many human cognitive abilities are intimately tied to and ultimately dependent on SMC. For example, research in developmental psychology demonstrates that SMCs play a crucial role in the development of higher cognitive functions such as Theory of Mind, imitation, language, imagination, conceptual thought, and abstract thought. This research shows that many advanced ‘off-line’ cognitive abilities, which are temporarily decoupled from overt behavior, are intimately tied to and ultimately dependent on SMC. In my thesis, I argue that SMC therefore forms the phylogenetic and ontogenetic basis of human cognition.

There are fundamental similarities between the behavioral strategies of single-celled organisms and those of more complex organisms equipped with centralized nervous systems. Our claim is that these behaviors are grounded in analogous SMC mechanisms that have evolved through convergent evolution on different scales of biological organization. On this view, a plausible scenario is that due to strong selection pressures, nervous systems evolved in the first place to enable SMC at the level of Metazoa: nervous systems merely provide a practical substrate for SMC that is tailored to relatively large multicellular organisms, whereas TCST-systems and ion-channels are required for enabling SMC at the level of single-celled organisms¹². The evolution of the brain was therefore not the watershed in the evolution of biological cognition, but enabled comparatively large multicellular organisms to exhibit similar SMC strategies to those that can be found at the bacterial level. With the evolution of the nervous system the organization of biological cognition could be expanded in unprecedented ways. SMC thus provides a universal organizational principle for biological cognition that throughout evolution has taken on a wide variety of forms, yielding a broad biocognitive spectrum from bacteria to humans.

How does this approach relate to other existing biogenic approaches to biological cognition? Previous biogenic approaches often adhered to the brain-based view of cognition,¹³ or equated cognition with autopoiesis¹⁴ or life itself.¹⁵ However, I agree with

¹¹ J. J. Falke, R. B. Bass, S. L. Butler, S. A. Chervitz, and M. A. Danielson, “The Two Component Signaling Pathway of Bacterial Chemotaxis: A Molecular View of Signal Transduction by Receptors, Kinases, and Adaptation,” *Annual Review of Cell and Developmental Biology* 13 (1997): 457-512.

¹² F. Keijzer, M. van Duijn, and P. Lyon, “What Nervous Systems Do: Early Evolution, Input–Output, and the Skin Brain Thesis,” *Adaptive Behavior* 21, no. 2 (2013): 67-85.

¹³ A. Moreno and A. Lasa, “From Basic Adaptivity to Early Mind,” *Evolution and Cognition* 9, no. 1 (2003): 12-30.

Margaret Boden¹⁶ that the latter approach conflates adaptation with cognition. Although SMC is ultimately dependent on the adaptive processes that sustain life itself, in my dissertation I argue that SMC constitutes a higher-order adaptive strategy that can be distinguished from other forms of adaptation, such as metabolic adaptation, phenotypic plasticity, and genetic adaptation. Bacterial taxis behaviors are not directly part of (epi)genetic alterations or adaptive changes in growth patterns and morphogenesis (although these behaviors are of course ultimately dependent on their outcome), but rather constitute a higher-order adaptive strategy that enables bacteria to optimize the external conditions for these other adaptive processes through SMC. On this view, there is still a deep phylogenetic continuity in biological cognition, but there are also specific boundary conditions in the form of SMC mechanisms that clearly demarcate the domain of biological cognition.

Another universal principle that I discuss in my dissertation is *cognitive bow-tie architecture*. This principle is derived from work in systems biology that has identified bow-tie architecture as a universal organizational feature of biological systems.¹⁷ Bow-tie architecture is an organizational feature that is found in the vertebrate immune system, gene-protein networks, metabolic networks, and signal-transduction systems. Bow-tie architectures are global control systems that are characteristically organized around a core of closely coupled, phylogenetically conserved processes, which provide a versatile interface for a wide array of input and output processes. According to Csete and Doyle,¹⁸ the benefit of these conserved cores is that they facilitate high flexibility in the peripheral input and output parts of the bow-tie structure. These peripheral parts can therefore be more susceptible to epigenetic modulation, which allows bow-tie control systems to adapt flexibly to local conditions. This kind of architecture is the result of evolutionary optimization processes that promote organizational efficiency, robustness, and evolvability.

Bow-tie architectures are usually hierarchically organized structures made up out of several nested bow-ties. For example, Zhao et al.¹⁹ found that the topology of the metabolism of bacteria such as *E. coli* consists of a hierarchy of nested bow-tie control systems that are integrated in the global metabolism. Several authors argue that this nested hierarchical bow-tie pattern is the result of evolutionary optimizing processes and that this type of recurrent bow-tie organization is an efficient way of biological organization that enhances robustness.

¹⁴ H. Maturana and F. Varela, *Autopoiesis and Cognition: The Realization of the Living*, Boston Studies in the Philosophy of Science, vol. 42, ed. Robert S. Cohen and Marx W. Wartofsky (Dordrecht: D. Reidel, 1980).

¹⁵ E. Thompson, *Mind in Life. Biology, Phenomenology, and the Sciences of Mind* (Cambridge, MA: Harvard University Press, 2007).

¹⁶ M. A. Boden, "Autopoiesis and Life," *Cognitive Science Quarterly* 1 (2000): 117-45.

¹⁷ H. Kitano, "Biological Robustness," *Nature Reviews: Genetics* 5 (2004): 826-37.

¹⁸ M. Csete and J. Doyle, "Bow Ties, Metabolism and Disease," *Trends in Biotechnology* 22 (2004): 446-50.

¹⁹ J. Zhao, H. Yu, J. Luo, Z. Cao, and Y. Li, "Hierarchical Modularity of Nested Bow-Ties in Metabolic Networks," *BMC Bioinformatics* 7 (2006): 386.

My hypothesis is that *cognitive bow-tie architecture* is an important organizational feature of natural cognitive systems. Cognitive bow-tie architecture refers to the feedback control architecture that regulates the SMC capabilities of organisms. This type of architecture characterizes the make-up of the bacterial two-component-signal-transduction system (TCST), a highly versatile signal-transduction system that has been co-opted by many different processes, including gene regulation and chemotaxis. I hypothesize that cognitive bow-tie architecture is also a fundamental organizational feature of the human brain and, more broadly, the human cognitive system.

Given the high metabolic expenditure of brains, the principles of “using least wire” and limiting connections and energy consumption are important organizational constraints on the evolution of complex nervous systems and brains. Centralized brain mechanisms limit connection costs in brain wiring and also accommodate the need for specialized action-selection structures that co-ordinate different action subsystems that compete against each other for behavioral control.²⁰ The cores of the cognitive bow-tie architecture are phylogenetically conserved, hierarchically organized neuronal core systems, which govern progressively higher levels of sensorimotor control. Different structures along the neuraxis, such as the medial reticular formation (mRF) in the core of the brain stem, the basal ganglia, and the forebrain, provide such substrates for action-selection that supplement each other and exhibit aspects of hierarchically organized or “layered” cognitive bow-tie architecture.

From a theoretical perspective, cognitive bow-tie architecture provides an economical solution for coordinating a wide variety of sensory systems, motor systems, emotional systems, and memory systems and involves reusing and sharing efficient resources such as centralized control systems. The core mechanisms are robust, evolutionary stable, highly constrained organizational units, while the peripheral mechanisms are only softly constrained structures, which form flexible sensory input and motor output pathways that are more susceptible to epigenetic modulation. This combination of evolutionary stable core systems and highly flexible peripheral systems optimizes the relation between adaptability in the short run and evolvability in the long run. We assume that cognitive bow-tie architecture is a universal feature of brain and cognitive organization and that this principle provides a way to understand how features such as modularity, hierarchical organization, co-option, and epigenetic organization are related and integrated in a global SMC control architecture.

I was contacted by Prof. Joel Isaacson a few months ago, with the question whether, and if so how, RD would fit into my framework. We are currently collaborating on an article for a future edition for JSP. We believe that there is compelling evidence that three highly evolvable co-dependent features: (1) sensorimotor coordination, (2) recursive distinctioning, and (3) cognitive bow-tie architecture are ubiquitous throughout the phylogenetic tree of life and provide universal features of biological forms of cognition, from bacteria to humans. Our assumption is that SMC is ultimately dependent

²⁰ T. J. Prescott, “Forced Moves or Good Tricks in Design Space? Landmarks in the Evolution of Neural Mechanisms for Action Selection,” *Adaptive Behavior* 15 (2007): 9-31.

on an organism's ability to perform the RD function and that RD also lies at the very foundation of cognitive bow-tie architecture.

We are aware that at this stage some of our claims are purely hypothetical, but also that these claims can easily be empirically validated or falsified. There are already computational models (Turing machines) that show that RD processors exhibit oscillatory properties that are similar to those found in bacterial receptor systems. With regard to investigating the validity of cognitive bow-tie architecture, it will be necessary to map the connectivity architecture of the human brain and the brains of other organisms to see if these do indeed exhibit nested bow-tie architecture.

It is clear that more research is required to prove beyond a reasonable doubt that these principles are truly universal biological mechanisms and organizational principles. If validated, these universal principles of biological cognition could provide a significant contribution to cognitive science. Moreover, the discovery of universal principles of biological cognition could help us to go beyond mere speculation, so that we can come to a biologically plausible understanding of how intelligent life on other planets might have evolved.

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Postscript by Dr. Louis H. Kauffman, Professor of Mathematics, University of Illinois at Chicago: Comment on “Recursive Distinguishing”

This remark will be in two parts. The first part points out that using the concept of distinction as a foundation for cognition is necessarily circular – because cognition is required to understand distinction. This is the conceptual level of this discussion. The second part is devoted to some speculation about what happens in practice when we take the point of view that systems are based in certain key distinctions. Then things flip over and it becomes clear that it is very fruitful to think in terms of distinctions and recursive production of distinctions from levels of distinction.

Part 1. Epistemology

There is a problem in identifying recursive distinguishing (RD) as a natural law. Let me put this as simply as possible. In order to have recursive distinguishing we must have distinguishing. Once there is distinguishing, then it can be applied recursively. There can be no problem with that and once one has a given system of distinctions that can be reliably performed: then systems of recursive distinguishing arise naturally and they do so arise. However, the problem is in knowing what is meant by distinguishing itself and locating just how and where this apparent act occurs in organisms and cognitive systems. What is an act of distinction? In using language this way, we come close to the limits of language itself.

There can be no definition (in the sense of mathematical definition) of the idea of distinction. To see this, note that a definition is itself a certain form of distinction. Thus any definition of distinction will be circular, involving the concept in its own articulation. In other words, distinction cannot be the basis or the natural law behind cognition because having distinction already assumes cognition and understanding. Thus there is no way to take distinction as a theoretical basis for cognition and we are left to ask and to continue to investigate how acts of distinction, acts of creation, arise in cognitive systems.

If one takes sensory motor coordination (SMC) as a necessary and sufficient condition for biological cognition, as does Dr. van Duijn, then this assumes that our ability to make distinctions arises from and is completely encapsulated by physical biology. Then, again, the distinction-making that we do as cognitive organisms is secondary to the SMC and is not at the level of basic natural law. One can point to operations of a physical system and call them “the making of distinctions,” but in fact such operations are seen to be the making of distinctions only in the eyes of an observer whose cognition is already assumed to be present before such explanations begin.

Part 2. Systems and Distinctions

Having stated this point of view about the epistemology of distinction and cognition, let us continue and comment on how it impacts scientific observation. We take an observational stance in looking at any biological or computational system and within this stance we see or design systems of distinctions that can be seen to operate in the mechanism of the system. At this level, the idea of describing such systems as

recursive distinguishing is fundamental and very useful in sorting out both the structure of the system and its creative action. This includes studying cognition, where we can see in many instances that complex cognitive structures arise by the way they produce distinctions and act upon them to produce new distinctions. In this sense recursive distinguishing can be regarded as fundamental to biological cognition. The circularity in the epistemology is fundamental also to the subject and is one of the reasons why cognition will never be explained from some set of mathematical axioms.

An example may be useful at this point. There is a famous model of autopoiesis due to Maturana, Uribe, and Varela²¹ where one makes a computational substrate consisting of “molecules” that like to bond with one another in the presence of a “catalyst.” These molecules are distributed randomly in a plane space. The result is that over time, the catalysts become surrounded by circularly closed rings of bonded molecules. These rings are seen by an observer as “protocells.” Due to the properties of the model, bonds have a certain probability to decay and molecules wander about, but with the parameters set appropriately, the protocells have lifetimes and can even be observed to interact. The key point about this model and the exciting point about it is that the distinctions (between inside and outside with the catalyst on the inside) that arise in the form of protocells do so ON THEIR OWN. Thus we see an example of a system where distinctions arise without a mind to direct them and these distinctions are then seen by an external observer. This is one way of thinking about it. The other way of thinking about it is to say that there are no distinctions between inside and outside occurring in this model except as seen by an observer.

Now consider another example. The biologists Cozzarelli, Spengler, and Stasiak devised a technique in the 1980s for coating DNA molecules with protein in such a way that the DNA appears thick and ropy under the electron microscope. They then used this technique to produce electron micrographs of DNA that convinced everyone that DNA could be knotted! One sees the weave in the electron micrograph and becomes convinced that this weave is a reality in the molecular biology. Now we all agree that it requires observers to obtain this information. We have to look at the electron micrograph and decide that the weave is knotted. But we do not, as scientists, assert that the weave does not exist without the observation. The logical sequence for us is that the observation implies the existence of the weave. The knot is implicated by our observation and becomes, through that observation, a real knot in the biochemical world.

By the same token, we must admit that many systems operate on distinctions and even make distinctions. These distinctions become real for us because we can stably observe them and, of course, we may be in the position of having created them.

What about cognition? Well again, it depends upon where you draw the line. Do you see the human visual system as an RD automaton making distinctions with distinctions and producing the high-level summaries that we take to be our vision? Then you draw a

²¹ F. Varela, H. Maturana, and R. Uribe, “Autopoiesis: The Organization of Living Systems, Its Characterization and a Model,” *Biosystems* 5 (1974): 187.

line where cognition appears through the visual system. But also vision appears through the conceptual lenses that we wear (the Kantian *a priori* if you will) and this is also an RD system. And so we back up and put that on the automatic side of the line. We can do this again and again until there is nothing left on the other side except our awareness and our understanding. Awareness and understanding are described by us as whole-system properties and so we come full circle.

There are those who believe that awareness and understanding are whole-system emergent properties of the underlying RD automaton of our biology. There are those who do not believe this and imagine that there is something extra. And there are those who reason as I have reasoned above and conclude that cognition is fundamentally circular and that it is illuminated by a combination of the automatic and the aware.

At this point I will read this essay again from Part 1 and I suggest that the reader rethink these issues as well.

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Response to the Postscript by Joel Isaacson

Dear Lou,

I followed your suggestion and read your comments thru a number of rounds. Following are the thoughts that occur to me.

In regard to Part 1, Epistemology, your pointing out the circularity between a first distinction and primordial cognition is important. This, indeed, represents a fundamental dilemma. The question though is: does this basic dilemma warrant conclusions about RD as a natural law? My thinking at this time is no.

To see this, I invoke the classic chicken-or-egg dilemma (COED) which shares the same circularity as the dilemma that you pose. For all I know, COED is undecidable. Yet, no one who deals with COED concludes that nature does not produce both chickens and eggs in abundance. So, there is separation between logical undecidability and the natural phenomena in question.

(As a side comment, I think that assuming linear-precedence logic in inherently circular situations, i.e., A entails B and B entails A, may be part of the problem in formulating and resolving COED. Some sort of dialectical logic, where both A and B are co-dependent and concurrent, perhaps in rapid oscillation, may be worthwhile. But I make no claim to resolving COED.)

Now, RD as natural law is advanced as a hypothesis, subject to verification or falsification. So, the issue of whether or not RD is a natural law is not acute for practical purposes. The issue is whether RD, especially when expressed as an automaton, is practically useful for the cybernetic study of biological cognition. I think that, in Part 2, you amply indicate that it is.

Your comments on the requirement for an aware observer are acceptable to me, as is your comment on symbiosis between RD automata and aware humans. Here, the tree-in-the-forest dilemma may be invoked, where some people can argue that in the absence of a hearing agent no noise would be generated by such an event.

In RD automata the role of an observer is perhaps more subtle. Looking back at how RD automata have been developed, it is clear to me that the automaton, by itself, is not aware of its performing RD. I have happened to be the observing agent who constructed after the fact, thru meticulous observation and awareness, the patterns of RD that are generated by RD automata. So, I am inclined to accept that a mix between the automatic and the aware is, as you propose, a good way to go in thinking about these matters.

So, with all your reservations and caveats from both Part 1 and Part 2, I think that the bottom line is that RD automata are potentially useful for the study of biological cognition.

In as much as RD concepts are missing so far from cybernetic thinking (there certainly has been a lot of talk about distinction and about recursion, but not on the tight combination of recursive distinguishing) I think that it would be important to inform our cybernetic community on the potential of RD. Perhaps add it to your thematic list that you proposed recently.

Best,

Joel

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About the Author: Marc van Duijn studied experimental and theoretical psychology at Leiden University and the University of Toronto. In 2012, he received his PhD in theoretical philosophy at the University of Groningen, the Netherlands. His research focusses on the interrelationship between biology and cognitive science. Currently, he is a lecturer at the Faculty of Sciences at the Free University of Amsterdam. Email: Marc.van.Duijn@gmail.com.



Editors' Postscript: The leadership of Kepler Space Institute and *The Journal of Space Philosophy* thank Dr. Joel Isaacson, Dr. Marc van Duijn, and Dr. Louis Kauffman for each of their contributions to the science of this critically important subject for all of humanity and for those in the Space Sciences planning the future of humans in Space.

We want to make an important macro point. Stephen Hawking and Leonard Mlodinow, in their 2013 book *The Grand Design*, write the following:

Philosophy is dead. Philosophy has not kept up with modern developments in science, particularly physics. Scientists have become the bearers of the torch of discovery in our quest for knowledge.²²

While Stephen Hawking and Leonard Mlodinow were right in that general statement about the relevance of philosophy to science, in that philosophy is often some way behind the cutting edge, refocusing philosophy to make it more relevant might be a better solution than abandoning it. That is exactly why we have dedicated *The Journal of Space Philosophy* to staying ahead of modern developments in the Space sciences. The discoveries by Dr. Joel Isaacson of *Nature's Cosmic Intelligence*, this related article by Dr. Marc van Duijn on *Universal Principles of Biological Cognition*, and the comments above by Dr. Louis Kauffman all place them as the bearers of the torch of discovery in the sciences of Intelligence and Cognition. Our Kepler Space Institute Team members are privileged to document their discoveries and their theories. Assisting in creating needed new research to advance the discoveries and the theories of Space sciences is a major part of Kepler Space Institute's mission and vision. [Bob Krone and Gordon Arthur](#).

²² Stephen Hawking and Leonard Mlodinow, *The Grand Design* (New York: Bantam Books, 2013), 1.

Expansion of the Civilization in Space: A Moral Issue

By Adriano V. Autino

ABSTRACT

Several philosophers (including Hawking, Lovelock, and Ziolo) warned about the implosion of civilization in the course of this century due to the unsustainable growth of humanity within the closed system of our mother planet. The global crisis, which began in 2008, is a deep crisis of resources, initially manifested as a financial crisis. Such a crisis could be one of the cyclical downturns, analyzed by Nicolai Kondratieff, which occur with a frequency of about sixty years and it could last 20 years. At this critical stage of human history, a nihilist thread is gaining momentum – so-called degrowth – in which nature is taken as an ethical model and is increasingly revered, while the value of human life declines. These philosophies are proposed as love and respect for nature, but they threaten the survival of humanity. Proponents of astronautics, ever looking for *rationales for space*, must focus on a counter-philosophy: that the expansion of civilization in space is a moral issue. Not expanding civilization into space would be a real, specific suicide: a rapid decline and the end of humanity as a cultural species. Such a waiver would therefore be a crime against humanity. Economic and social growth is absolutely necessary for the development of a fully inclusive human society, free and democratic. The resources of the solar system are virtually endless, covering human needs for several millennia. Therefore, while the modern Savonarolas advocate a season of thrift and *wise administration of misery*, we should learn to handle the large abundance and freedom that we will find in space. The only possible evolutionary step is to step into space (Ehricke, Hawking, Ziolo, Wolfe). Humans are midway in their journey from animal status toward full human status, emancipated from the natural behaviors of murderous ferocity and exploitation. This step can be completed only by expanding in space, and accessing a platform of virtually infinite resources and energy.

Refutation of the De-Growth Doctrine

In this time of global crisis, those who feel responsibility toward their own species and its social evolution sometimes face a feeling of frustration and helplessness. It is disheartening to see some philosophers advocating a path of decline to counter what they view as unsustainable development. They would abandon so-called consumerism and promote a kind of *moralization* in society, through mass conversion to a sort of existential Franciscanism. They accept the prospect of a socio-economic degradation, if not of a real Armageddon, which is involved by the *de-growth* option.¹ In the extreme, this purported moral action would place nature and the environment above other human beings.

Unfortunately, the post-industrial society, which aimed for more ethical, democratic, and libertarian socio-economic models, is now facing the perverse effects of the gradual disappearance of industry (1000 enterprises per day were closed in Italy, during 2012).² The de-growth ideology has a heavily depressing effect on the

¹ Serge Latouche, *Petit Traité de la Decroissance Serene* (Paris: Mille et un nuits, 2007).

² See http://oivcamcomca.blog.tiscali.it/2013/01/25/unioncamere-la-crisi-determina-la-chiusura-di-mille-imprese-al-giorno/?doing_wp_cron.

economy and, ultimately, it is therefore a cause of regression and civil involution. Claimed as a highly moral option, the de-growth is therefore highly immoral, because it acts not to reduce suffering in general, but to increase it, not to decrease social fear but to increase it, not to provide more job opportunities and self-realization to people, but to decrease all of these.

The de-growth world view does not consider the acquisition of resources where they are in abundance: in space! Many of the de-growth advocates are prey to the syndrome of the pre-Copernican closed world. They simply do not see the evidence because they have a well-barricaded mental bureaucrat (as Robert Pirsig wisely wrote),³ which imposes almost immovable blinders on them. Many are afraid of change and in particular they see space with horror. Many see de-growth as an opportunity to get rid of capitalism or even to destroy it. Many see the scarcity of resources and the perspective of de-growth as a great opportunity for the triumph of the supposed moral criteria of frugality and modesty. For the pre-Copernicans, there may soon be a Copernican revolution,⁴ which will make them open their eyes.

Moralistic Exhortations Are Not the Real Drivers for Change

All moralizers and/or promoters of revolutions rely on some kind of change in people's attitudes. But the great social changes never took place due to *moral awareness* campaigns. The true factors of change act at a structural level. A real ethical advance occurs only when, in the society, the level of fear and insecurity decreases and, in parallel, the chances for social growth increase, or, to say it with Maslow,⁵ people achieve easier ways to meet their basic needs. The fact that the level of ethics tends to grow up in such conditions testifies to the positive background of human nature, or at least the cultural profile of the humans of the twentieth and twenty-first centuries. Once they have solved their basic needs, the majority of people do not tend to get lazy and to deprave themselves, as the proponents of coercive social models maintain, but aim high to art, culture, solidarity. A few of the super-rich still prefer spending one million euros for a week on a yacht, refusing at the same time to support culture and art, but they are not the majority. Many wealthy people would be available to support progress, if the proper information, links, facilitations, and solicitations were provided by public institutions.

Idealism, Coercion, Freedom

The century of great authoritarian collectivist ideologies – Fascism, Stalinism – is now behind us, but the established practices of the single mindset imposed by various coercive methods are characterized by high social inertia. Those who own or believe they have insights into possible social improvements strive to achieve 100% approval of their ideas. Often, when they cannot achieve this, they turn to using force and coercion. So, from the point of view of the progress of civilization, the moral issue concerning our discussion, every social process of coercion, and any subsequent revolution results in setbacks, because it reproduces in large proportion

³ Robert M. Pirsig, *Lila: An Inquiry into Morals* (New York: Bantam Books, 1991).

⁴ A. V. Autino, "The Copernican Evidence - Requirements for a Space Age Philosophy", IAF Paper No. IAC-02-P-P.23, 2002, 53th International Astronautical Congress, 10-19 Oct. 2002, Houston, TX, http://www.spacefuture.com/archive/the_copernican_evidence_requirements_for_a_space_age_philosophy.shtml.

⁵ http://en.wikipedia.org/wiki/Abraham_Maslow.

the anti-ethical behavior of murder, brutality, and oppression. Idealism, as demonstrated by the history of the twentieth century, is therefore quite dangerous, because it is strongly inclined to adopt a coercive character. However it would be quite wrong to abandon idealism or any ideals. Ideals are in fact necessary for the progress of civilization.

There is, however, a relative diversity among ideals, as far as the danger of coercion is concerned. Indeed, there are ideals which, by their very nature, need to be shared by 100% of the population, so they hold the seed of coercion in their DNA. The more absurd a theory is, the more it requires the use of coercion in order to become a state law. Socialism based its ideology on a much more logical foundation: equality and social justice. However the applied recipes – nationalization of the whole economy, just to mention the most striking example – required 100% popular support: the Stalinist faction then took over when such consent was not reached through the direct democracy of the people's councils (Soviets). Leon Trotsky, the proponent of a democratic and mixed economy (public and private) and a multi-party political system, was exiled and then murdered, the people's councils were transformed into a mere instrument of control by the bureaucracy in power,⁶ and the country entered the tunnel of dictatorship, with the consequent annihilation of any aspiration to better social relationships and a moral devastation that has had little or no analysis.

In general, when ideals are applied to closed and restricted environments, characterized by scarcity of resources, ideals tend to coercion. Nowadays, the symptoms of what could be the large-scale application of the de-growth ideology are already visible. The conditions are all in place. A close and narrow environment: the world populated by more than seven billion people. The inability to achieve 100% of the vote: granted that by flattery and moral exhortations the de-growth party could get an initial majority democratically. A population reduced to poverty and hopelessness can only rebel, later. Any social proposal based upon restriction of space and resources can only end in coercion and authoritarianism and soon the alleged equitable sharing of scarce resources will end up the pockets of the managers at the expense of the managed, as has always happened in history.

The astronomical expansionist ideal, in contrast, proposes a lot more freedom, because it tends to reduce the social pressure and simultaneously to increase the resources available for development. It does not work, then, on a subtraction of resources, since it is the only option that does not work at zero-sum. It does not necessarily require 100% of the vote: whoever does not want to migrate can be shut in safely at home and still get great benefits in the context of the economic growth brought by the process of expansion and the use of new resources. The astronomical expansionist ideal requires, of course, a good level of consensus, but aims primarily at the consent of the skilled and those with a high cultural level, businesses, and scientific-technical players. It develops a political proposal, at international level, to all the governments of at least the spacefaring countries, inviting them to adopt policies to support the development of commercial space

⁶ Isaac Deutscher, *The Prophet Outcast: Trotsky: 1929-1940* (London: Oxford University Press, 1963).

travel. No doubt, seven billion people are too many for one planet. There are only two alternatives:

- a) accept the prospect of a civilization implosion, which can happen in different ways, either as result of the generalization of a suicidal de-growth strategy or keeping on growing in a closed system;
- b) expand beyond Earth's atmosphere, initially into the geo-lunar space, and in time into the rest of our solar system.

Of the two, the only moral option is the latter, because it is a harbinger of civil and cultural growth for humanity,⁷ as well as potentially improving the Earth's environment for the benefit of other living species, animals and plants, with which we share this planet.

Value of Human Life and Religion

In order not to repeat here other concepts already presented in previous writings, I refer in particular to two works, the first one published in the *Journal of Space Philosophy*, where I discuss extensively the urgency of the development of the astronautic humanist philosophy and in particular the primary philosophical reasons in support of the imperative need for humanity to expand into outer space - "*If we are not humanist, we do not need space*".⁸ As extensively argued in the paper above referred, and in others, the priority ethical principle is the humanist principle, the supreme value of human life, the highest expression of nature and evolution – in spite of all our faults, as a cultural species that is just half-way towards a fully human status. The second reference is the article "The Value of Human Life."⁹ Religions of all tendencies sometimes defend some humanist principles, but generally give priority to other concepts, such as deity, nature, esotericism, a social class, or whatever.

Note the etymology of the word "religion". There are two meanings commonly recognized: from the Latin word *religare*, which means to unite people around a faith or ideology, and the word *religere*, which means to choose and take care, to pay attention. A religious community is therefore a set of people who share a philosophical orientation (not necessarily oriented to the divine) and observe with care and attention its precepts. The theist religions, assigning the state of perfection to gods and relegating man to the *human condition*, by definition imperfect, knowingly trace a path of growth *aiming to an in fact unattainable perfection*, attributed to the gods (omniscience, omnipresence, etc.). Mankind is thus indulgently encouraged to remain sinner, murderer, bully, *human*, therefore imperfect.

The churches' catechesis in general, however, appears mainly oriented to the stories of individuals and not to social aspects. First of all, the fate of civilization on the edge

⁷ Patrick Q. Collins and A. V. Autino, "What the Growth of a Space Tourism Industry Could Contribute to Employment, Economic Growth, Environmental Protection, Education, Culture and World Peace," http://www.spacefuture.com/archive/what_the_growth_of_a_space_tourism_industry_could_contribute_to_employment_economic_growth_environmental_protection_education_culture_and_world_peace.shtml.

⁸ A. V. Autino, "Facing the 21st Century's Civilization Challenges by the Tools of Astronautic Humanism", *Journal of Space Philosophy* 1, no. 1 (2012): 63-65.

⁹ A. V. Autino, "The value of human life", http://www.tdf.it/2005/vita_eng.htm.

between the cultural post-Copernican leap to the stars and the implosion would be well worth being discussed by religions. While the naturist and animalist religions appear totally disinterested in the value of human life, the main churches – Catholic, Protestant, Buddhist, Judaism, Hinduism, Islam – are nominally respectful paladins of human life. As far as the religions of the naturist, vegan, animalist, strand, it would be reasonable to expect that their adepts took into consideration the space expansionist option, which would lighten the burden on the terrestrial environment by the weight of our development. However, since these people are often strongly opposed to science and technology, the discussion with them is still quite difficult, partly because they often refuse reasoning that they deem too complex.

Thus we sense the urgently needed birth of a great *secular humanist religion*, which puts in first place the objectives of protection of human life and the continuation of civilization. Such religion can easily coexist with traditional religions and will not solicit any conversion: rather it will ask its members to bring the good principles of astronomical humanism within religious or political communities, so that a good number of people (not necessarily 100%!) take active responsibility for it.

The Cultural Faults Produced By Antihuman Ideologies

In the aberrant conception of the naturist ideology, nature is taken as an ethical model, rather than studied to understand its systems. The predators, in particular, are admired for their beauty and even in this case there would be little harm in doing so. However, the obsessive reiteration, particularly evident in social networks, of such admiration, brings out comments on the verge of idolatry. The predator is taken as a model, since it kills to survive and it does it with innocence, lacking the capability to reason. This concept leads weak minds (of which, unfortunately, there are never a few!) to exalt and enhance their poor reasoning skills to a “more natural” state and closer to the innocent ferocity of the predator. The continuous use and abuse of the term *natural*, opportunistically and improperly used by many manufacturers of all kinds of products (food, cosmetics, detergents, etc.), testifies to the strong and very broad trend existing in society, according to which everything natural is good and what is instead the product of human ingenuity is bad (sophisticated, thus in their conception harmful). In this way the very concepts of science and technology are belittled and demonized, promoting and accelerating the cultural decline of humanity. The expansion in space, adventure that must necessarily be based upon a solid scientific paradigm, is the only option that can reverse such an absurd trend and return intellectual commitment to the role and the importance it deserves. It will be a social process of titanic proportions. Not surprisingly we talk about a renaissance of humanity in space, that is, the Space Renaissance.¹⁰

The Stakes: A Solar Civilization or the Return to a Stone Age

What is at stake is more than epic. We at Space Renaissance are not the only ones talking about the danger of a civilization implosion. Prior to our movement,

¹⁰ A. Autino, P. Q. Collins, A. Bynum, S. Moss, F. Stratford, N. Jarvstraat, M. Martin-Smith, M. Dudziak, K. Ford, D. Walt, A. Kotarski, A. Woods, V. Werner, and A. Volkonskiy, “The Space Renaissance Manifesto”, Approved by the Space Renaissance Initiative 15th Meeting, held August 29th 2009, http://www.spacerenaissance.org/papers/The_Space_Renaissance_Manifesto.pdf.

philosophers such as Krafft Ehrlicke¹¹ and Robert Pirsig (the latter very old but still alive) have addressed the issue of human evolution, in different terms of course, but in some ways consonant. Contemporary philosophers such as Paul Ziolo,¹² Stephen Hawking,¹³ and James Lovelock have spoken out about the probable implosion of civilization within this century, if it does not expand into space. The highly moral character of expansion into space is more and more obvious and it should now overflow from the still restricted numbers of astronomical humanists in society. Always on the brink of global conflict, civilization is screwing in a continuous crisis, which destroys jobs and know-how at an impressive rate.

Nicolai Kondratiev,¹⁴ a Russian economist who died in a Stalinist gulag, analyzed the history of economics since late 1700 and found a cyclical pattern that sees deep crises lasting roughly twenty years, with a frequency of about one every 60 years.¹⁵

Prof. Ziolo, of the University of Liverpool, analyzes the five cycles of Kondratiev from the late 1700s, and makes his prediction for a hypothetical sixth cycle:

The existence of these cycles or Kondratyev waves of an approximate 52-year duration prior to the Industrial Revolution remain contentious issues, but their structure emerges clearly during and after the 18th century. We have so far experienced five major Kondratyev cycles, each of which was initiated by a wave of “core” technologies. A sixth cycle is imminent, and its effects are already beginning to be felt. According to Tylecote (1993) the core technologies that initiated each of these cycles are as follows:

1. Water (Britain) beginning c. 1780-90,
2. Steam Transport (Britain – U.S.), beginning c. 1828-32,
3. Steel and Electricity, c. 1874-80,
4. Fordism, c. 1913-18
5. Microelectronics, c. 1973-83

The upcoming sixth wave, advocated by Ziolo, would be triggered by *GRAIN* technologies (Genetics, Robotics, Artificial Intelligence, and Nanotech). But this prediction was made in 1995, and none of the (terrestrial!) mentioned technologies has triggered a new industrial revolution so far. It is more than an educated guess, by now, that any innovation, if confined within the limits of our planet, it is unlikely to reverse the trend. The current crisis, because of its global nature, its root causes, and its combined effects – the scarcity of resources, job destruction, the immature conflict for resources and energy, environmental decay – could be the last and could lead directly to the implosion of civilization. In contrast, the Space Renaissance,

¹¹ Marsha Freeman, *Krafft Ehrlicke's Extraterrestrial Imperative* (Toronto, ON: Apogee Books, 2009).

¹² Paul Ziolo, “Futures”, http://www.spacerenaissance.org/papers/PaulZiolo_Futures.pdf.

¹³ Stephen Hawking, Interview with BBC, <http://news.bbc.co.uk/2/hi/science/nature/6594821.stm>.

¹⁴ http://en.wikipedia.org/wiki/Nikolai_Kondratiev.

¹⁵ http://en.wikipedia.org/wiki/Kondratiev_wave.

acquiring new resources and energy for development, would play a decisive role as a catalyst for an industrial and cultural revolution without precedent.¹⁶

The industrialized West, nowadays largely post-industrial, is the holder of a huge moral responsibility regarding the fate of mankind. The only answer that the so-called advanced countries have been able to provide so far is still and always war, to try to stem the violence in the most primitive countries, which have not yet experienced a true industrial revolution. The people who gave birth, in the last years, to the “Arab spring”, nowadays reached by global information, became aware of the living standards of the advanced countries and legitimately aspired to their social growth. But their bourgeois revolution, while overthrowing the most oppressive and corrupt dictatorships, runs the risk of jumping from the frying pan into the fire, into the hands of Muslim fundamentalism. In the absence of a true industrial revolution, no wizardry can add the salt of democracy in tribal societies, let alone impose democracy by military force. The West finds itself caught between a rock and a hard place: giving military support to the Arab revolutions often means fighting on the same side of the Taliban militias or Al Qaeda! Supporting the hated dictatorial regimes guilty of appalling massacres of civilians, on the other hand, is not possible. It should also be noted that when bombers come in to play in the revolutions, though reducing the military force of the *ancien regime*, the effect on the population and its capacity for self-organization is often quite depressing: if others do the revolution, it is no longer a popular revolution! The people are no longer the subjects who win and build democracy, but they become a people who are weak and unorganized, going back to split into tribal factions, militias, and bands of armed marauders. It is therefore becoming clearer and clearer that Western military power, in this situation, is not only useless but more and more harmful. From the economic point of view, while the wars of the last century often had a positive effect on the markets, today’s wars have completely the opposite effect. The price of oil undergoes new wheelies at any hint of war and the effect on a global economy already exhausted by the crisis is further depressing.

Giving Up Expansion into Space Is a Crime against Humanity

Should our civilization renounce expanding into space during the current century, those responsible for this decision would be guilty of a true specific suicide (suicide of the human species). In fact, at the end of a path of de-growth, only disappearance can be found. The waiver of civilization’s expansion into space would have a high cost: a rapid decline and the end of humanity as a cultural species. The waiver of expansion into space would therefore be a crime against humanity, far worse than all the crimes perpetrated in the past, including the Nazi holocaust and the Stalinist purges. Economic and social growth is absolutely necessary for the development of a human society, fully inclusive, free, and democratic. The resources of the solar system are virtually endless and can cover human needs for several millennia to come.¹⁷ Of course human expansion into space is a necessary but not sufficient condition: in order really to grow up in ethics, a good amount of strong will is needed. But, reading human history through realistic glasses, we can see that ethical

¹⁶ A. V. Autino, A. Cavallo, and P. Q. Collins, “Three Theses for the Space Renaissance”, 2011, <http://www.lulu.com/commerce/index.php?fBuyContent=10003567>.

¹⁷ A. V. Autino, “The Fifth Season – The Space ‘Bingo’ Surprises: Very Profitable and not Obvious Gifts of Space”, 2005, <http://www.tdf.it/IC1/acta/aa/AC05E1P03.pdf>.

advances have occurred each time life conditions have improved. The moral imperative, thus, is to create the resources and energy platform necessary for a giant cultural leap. We should learn to manage abundance, something for which we have not even a word. The word *economy*, in fact, historically means *management of scarce resources*. We need a new word to signify the *management of abundant resources*.

One Possible Choice: Aim High!

Given their great responsibilities, having seen the failure of international politics and of the military strategies, what remains to be done by Western countries to get out of the quicksand of the global crisis? As also happens in everyday life, we often find ourselves insisting on known behaviors, even though they may prove to be completely ineffective or even counter-productive in a given situation. In the case of states' policies this is true to the nth degree, so many are the powers and easements established in the bureaucratic structures that govern the great democracies. However, if we stop and think sometimes, we will see that we own other instruments, much more suitable to solve the problem that we are worried about and that we are not using them only because we are caught in compulsive behavior, which prevents us from considering different solutions. For some years now there have been talks about a possible *clash of civilizations*. And of course, in this comparison, the West considers itself superior. But how should such claimed superiority express itself?

The territory on which the West could prove its superiority is not the military one, as was amply demonstrated. Indeed, by insisting on the military option we will prove exactly the opposite: They kill us, we kill them. The fact that we do it with the most technologically advanced weapons surely does not certify our moral superiority.

Rather, the territory on which the West should qualify is the moral one, accepting the most critical challenge of all times: leading humanity out of this terrible crisis, which otherwise might be its last crisis, the definitive one. The real moral superiority is in civilian culture, science, and technology. The competition can be won by demonstrating cultural superiority, conquering new spaces and new resources for the whole of humanity. This is the real moral challenge of this century. There are indeed many ways to win without killing and destroying. Non-lethal weapons systems¹⁸ are for sure a method that should be developed further and faster. But going out to look for new resources and energy for all of humanity, to get out of our beloved Earth, to create new space for living and working, things that our civilization desperately needs, is for sure the best and most urgent choice.

The Western countries have everything they need to give this substantial contribution to humanity. Why keep on waiting?

¹⁸ http://en.wikipedia.org/wiki/Non-lethal_weapon.

Global Democracy Possible Only In the Presence of a New Industrial Revolution!

In a recent article,¹⁹ *"The social turmoil in Egypt are new evidence of the risk of implosion of civilization,"* Rino Russo, along with myself, wrote:

The current despairing need of industrial development of the regions defined "pre-industrial" like Egypt, is counterbalanced by the equally desperate need for new industrial development of regions defined, with much complacency and carelessness, "post-industrial". There is no valid method to add the salt of democracy to countries characterized by strong aspiration to growth! As noted by the Nobel Prize Amartya Sen, the information is much more important than gunboats, and the poor and underdeveloped "wake up" only when they get the information of the higher standard of life that exists in other countries... For sure, from the point of view of ethics, it makes a deep impression that the Egyptian army, in order to defend democracy against Islamic fundamentalism, stains itself of the murder of hundreds of people. But it should not be surprising. In these countries the consideration for the value of life has not even yet reached the lowest (and declining) level that exists in the industrialized countries. Even in industrialized countries, in fact, democracy is in a state of serious crisis, where the political parties and the various ideological currents do not have the capabilities for issuing true and strong development projects. That's why the civilization is living in conditions that prelude to a serious decline of general civilian and ethical values: because of the social processes in place, which collide with political leaderships completely incapable of guaranteeing the industrialization of emerging countries and re-industrializing the advanced countries. The development of the industrial economy is a key factor. Without growth there is no hope for democracy, peace, freedom, a concept originally proposed in 1776 by Adam Smith in "The Wealth of the Nations". Smith noted that the welfare of the lower classes of a nation depends on economic growth, and noted that stagnation and economic decline may lead to a worsening of poverty. In a static economy (condition entirely theoretical) a unique opportunity to improve their living conditions is to replace someone else (*mors tua vita mea*).

In a closed system, the economy soon becomes a zero-sum game, with a finite quantity of available resources. When this happens, economic growth becomes more and more a kind of lottery; the emancipation of the poorer classes and social growth in advanced societies becomes a memory of past golden ages. For the emerging countries that same social growth remains a dream: they may touch its realization, but they can only have a very small taste of it.

¹⁹ Rino Russo and A. V. Autino, "The Social Turbulence In Egypt Are New Evidence of the Civilization Implosion Risk: Global Democracy is Possible Only in the Presence of a New Industrial Revolution!", 2013, http://www.spacerenaissance.org/NEWS/SRITALIA_Editorial_01_The_Turmoils_in_Egypt.pdf.

Responsibility and the Role of Governments and Politics

Another article touches a particularly sensitive point for those who support human expansion into space: the responsibility of the major space agencies, primarily NASA, ESA, and the Russian space agency, for the scary delay in the expansion process, which in fact has been blocked for more than forty years.²⁰ Speaking about agencies, we speak of course about the governments to which the agencies belong and thus about political responsibilities. The European strategy has historically focused on the use of space for Earth: telecommunications, Earth observation, scientific payloads. ESA participates in astronomical programs, including human flight, only in partnership with NASA or the Russian agency and does not own in-house developed vehicles, other than expendable launchers for placing satellites into orbit. NASA was historically at the forefront, adopting a strategy focused on exploration and scientific experimentation. The Russian space program obviously suffered a setback as a result of the political changes that occurred with the fall of the Berlin Wall and the dissolution of the Soviet Union. But the Soyuz capsule remained in production and is currently the only vehicle able to carry astronauts to the ISS. Overall, forty years after the historic landing on the Moon, agencies have spent more than one trillion dollars of public money, but the first signs of the space frontier opening to private companies occurred only with the historic Scaled Composites victory of the X-Prize in 2004.²¹ This event marked the beginning of the crisis of the U.S. space agency, now seen as a governmental bandwagon, only able to spend huge amounts of public money, but not to develop technologies to reduce the cost of the earth-orbit transport or to encourage the development of space tourism and civilian astronautics. To avoid damaging the burgeoning industry of expendable rockets, NASA chose to quash the very promising X15 project,²² a fully reusable suborbital space plane, which in 1969 made 200 flights at an altitude of 100 km, in favor of the space shuttle, which was only partially reusable, built in five unique pieces, giving up even a modest industrial production. Scaled Composites realized the historic feat of designing and building a fully reusable suborbital vehicle with an investment of thirty million dollars, while each single flight of the space shuttle cost five hundred millions! Space tourism is now out of fiction and the first commercial suborbital flights may begin soon. But the newborn civilian astronautics industry is taking its first steps and, most important, it is not yet capable of independent development. So, if alone, it could fail to reverse the macro-economic trends before the crisis reaches a point of no return.

During the G20 meeting of September 5th, 2013, the big leaders finally agreed on the priority issue: growth. They should now consider the logical consequence of such a target, only feasible by means of a great new industrial development. The governments of the spacefaring countries should urgently fulfill their responsibilities and adopt policies to open up space to private enterprises: tax relief on investments in astronomical activities, support to business, making available the extensive know-how accumulated by space agencies for the implementation of commercial projects, encouraging the creation of specific space investment funds, encouraging the creation of theme parks, and the widespread dissemination of culture: we need to

²⁰ A. V. Autino, "The ideological failure of Space Agencies," http://www.tdf.it/2004/age_eng.htm.

²¹ A. V. Autino, "SpaceShipOne re-opened the way, after 36 years!" *TDF Newsletter* 1, no. 2, http://www.tdf.it/2004/n_12_eng.htm.

²² http://en.wikipedia.org/wiki/North_American_X-15.

develop political and public awareness. EASA and FFA must broaden their horizons and must treat systematically the issue of access to space regulation by developing security guarantees, but with a view to stimulation and not negative conditioning. International cooperation must make a quantum leap forward, putting an end to the anachronistic policy of embargo, except when justified by really serious reasons, helping countries willing to adopt a space program to make it happen in a short time and at a reasonable cost.

Everybody should do his or her part, in order to affirm the new paradigm:

- a) use public money for space exploration and for scientific experimentation in space;
- b) create specific space investment funds to support space industrialization.

This approach, which advocates the division of space agencies into two parts with different objectives, was born in the context of the discussion of the Space Renaissance Initiative in 2009 and was published for the first time in the paper written by Drs. Feng Hsu (NASA) and Ken Cox (ATWG), "A Unified Space Vision."²³

The role of governments is very important, especially as a stimulus and encouragement to invest. If civilization were lost due to the petty greed of those who could invest and did not do it, the demise might be well deserved! The greatest immorality is not to possess large capital; the real immorality is tying up capital and government policies should increasingly orient the taxation of non-invested capital and the de-taxation of invested capital. The proceeds of the frozen capital taxation should then be used to finance aid programs and tax relief for companies having the courage to embark on the space adventure.

Nothing is lost, yet. The substantial know-how accumulated by the agencies (and costing so much!) is still intact and the vortex of the global crisis has not yet begun to turn so fast as to eat all the cultural and technological resources of humanity. With the help of everyone and a marked increase in awareness by at least the relevant sectors of society, we can still make it. Errors and delays can still be recovered.

However, we should start as soon as possible.

Ad Astra!

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²³ F. Hsu and Ken Cox, "A Unified Space Vision", <http://www.spacerenaissance.org/papers/A-UnifiedSpaceVision-Hsu-Cox.pdf>.

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About the Author: Adriano V. Autino is the co-founder and president of Space Renaissance International (SRI). He is a member of the Board of Editors for the *Journal of Space Philosophy*.

His bio is at: www.spaceentrepreneurs.ning.com/profile/AdrianoAutino.



Editors' Postscript: Adriano Autino has given us an in-depth description and analysis for implementing our Kepler Space Institute recommendation for Space Philosophy, published in the Fall 2012 issue. The summary of that prescription is *Reverence for Life within Ethical civilizations – implemented by the Policy Sciences*. Adriano discusses values, culture, humanism, and ethical civilization and states the necessity of moving forward as a moral imperative. He even describes the failure to create solar civilization as a crime against humanity and goes on to include the role of governments. We encourage readers to continue the discussions on this critically important subject for the future of humanity. *Bob Krone and Gordon Arthur*.

Deep Space III: The Human Space Program

By Frank White

The author elaborates on his previous essays regarding a space philosophy, both based on the Overview Effect – the experience of seeing the Earth from space and in space. This third essay explores in more detail the significance of a “deep philosophy of space exploration” and what it would mean to us to create a human space program as we venture off of our planet and out into the universe.

In previous essays for this publication, I have written about a “deep philosophy of space exploration.” The primary element of such a philosophy focuses our attention on the benefits of human space exploration for the universe rather than primarily for human beings. This is not to say that space exploration is not beneficial to us, only that we should see the process as mutually beneficial for the parts (ourselves) and the whole (the universe).¹

Accepting that this is our basic philosophy of space exploration and that the Overview Effect is at the heart of the philosophy, what kind of space program or space movement needs to emerge to embody it in action?

As Bob Krone wrote in his essay for the first issue of this journal,² a philosophy need not be an abstraction that is irrelevant to our everyday life. In fact, a philosophy can be a guide to what we do and how we do it. In our case, a philosophy of space exploration ought to be based on certain principles that are then put into action.

The Star Trek Vision

As an example, consider the Star Trek philosophy of space exploration. Even though it is a fictional view of the future, many people have felt attracted to it, possibly because of its clarity of purpose. First, the Starship Enterprise has a simple and clear mission:

To explore strange new worlds. To seek out new life and new civilizations.
To boldly go where no man has gone before.³

Starfleet captains are also guided by a Prime Directive, which reads in part:

As the right of each sentient species to live in accordance with its normal cultural evolution is considered sacred, no Star Fleet personnel may interfere with the normal and healthy development of alien life and culture.⁴

¹ *The New Camelot* (Kindle Book, 2010), <http://tinyurl.com/lposvc3>.

² *Journal of Space Philosophy* 1, no. 1 (Fall 2012): 17-26.

³ Gene Roddenberry (Executive Producer), *Star Trek* (NBC/Desilu, 1966-1969). This was later changed, for the better, to “where no one has gone before.”

⁴ http://en.wikipedia.org/wiki/Prime_Directive.

When I wrote about the Human Space Program in 1987, I attempted to lay out an approach that was also clear and compelling in terms of its mission and basic principles. I defined it in the following way:

The embryonic human space program exists in all the national space programs, the private pro-space societies and activities around the world, and the actions of individuals working alone for a positive future. However, there is no unifying vision to balance this diversity, and the human space program is not yet a conscious human system. To give power to the emergent reality, then, let us declare the establishment of the program and provide it with a long-range plan from which it will be possible for aspiring Terranauts to choose their vocations and contributions.⁵

The following were described as the fundamental elements of the program, including its mission:

Vision: a universal civilization, a golden age, humanity taking its rightful place as citizens of the universe.

Purpose: to support humanity's understanding and achievement of its purpose as an active partner in universal evolution, creating overview systems that increase conscious awareness throughout that universe.

Long-term goals: establishing planetary, solar, and galactic civilizations as steps to a universal civilization.

Immediate objectives: creating conditions for planetary peace and humanity's migration to the solar system and the stars.

Participants: all human beings and other sentient species.

Spatial parameters: the universe.

Temporal parameters: the millennium, 2000-3000.⁶

By drawing this comparison, I am not saying that the human space program should directly mimic the Starfleet philosophy. However, there are aspects of the fictional Federation space program that have proven quite interesting to people and should perhaps be considered as an aspect of the human space program. In particular, it seems to me that their program is focused on *exploration*, *inclusion*, and *ethics*.

⁵ Frank White, *The Overview Effect: Space Exploration and Human Evolution* (Reston, VA: American Institute of Aeronautics and Astronautics, 1998), 171.

⁶ *Ibid.*, 172.

For example, the goal of the *Enterprise* is to explore, not conquer. It is not a military operation *per se*. Also, the *Enterprise* crew is emblematic of Starfleet's inclusion and diversity. Not only did the crew include members of every terrestrial race and nationality, but it also had extraterrestrials like Vulcans and Klingons. Finally, the ethic of non-interference in the evolution of other species means there is no hint of imperialism.

It seems to me that this tells us that the human space program, to be equally compelling and inspiring, must have a clearly defined mission and it must be based on basic principles that are not violated. Some 30 years after writing that early description, I believe we are close to that criterion.

When I first wrote about the human space program in 1987 in *The Overview Effect: Space Exploration and Human Evolution*, I likened it to the "central projects" of the Middle Ages, when the great cathedrals were built. In addition, though, I believe that, like Star Trek, we must be inclusive in fashioning a human space program and we must go even farther than I had imagined at that time. We need to be more open and inclusive on two levels, the individual and the global.⁷

On the individual level, if the Overview Effect is as critical to the future of humanity and the universe as we believe it to be, then logic suggests that having this experience should be seen as a *basic human right*, either by traveling into space or through a powerful simulation. Indeed, it might also be seen as a responsibility to have the experience and thereby more fully become a "citizen of the universe."

If this is true, then one of the most fundamental principles of the human space program must be that we are ending the era in which space exploration is limited to a few government employees and a wealthy elite. If a new epoch of evolution is about to be opened up as we move into the solar system, then everyone who wants to do so should be able to participate.

In practical terms, then, how do we implement this principle of individual inclusion for our space philosophy?

One proposal seems obvious. As private carriers like Virgin Galactic begin to take people on suborbital hops, we should establish what might be called "Overview Effect Scholarships" that would support ordinary individuals to go on these flights.

I call them "scholarships," not because they are academic in nature, but rather as an analogue to the financial aid received by students of modest means to attend colleges and universities. The goal there is to admit the most competent applicants regardless of financial capability. I would like to see the same idea implemented as we move out into the solar system. (Interestingly enough, the cost to endow a scholarship at a major university in the United States is about \$250,000. This is precisely the amount of money Sir Richard Branson is requesting for a Virgin flight to suborbital space.)

⁷ White, *The Overview Effect*, 5.

These scholarships should be established by a foundation or individual and have an organization like the Overview Institute or Space Tourism Society administer them. No matter how many scholarships we establish, the demand is likely to outstrip the supply, so we will need an organization dedicated to having more people experience the Overview Effect administering them. It is not nearly enough, but it is a start.

The second form of inclusion is global in nature. One of the key messages of the Overview Effect is that you cannot see borders and boundaries from orbit or the moon. It makes sense, then, to transcend national boundaries in the great adventure of exploring the universe.

We should therefore laud recent efforts to create a global space program in which many nations are participating. The International Space Station (ISS) represents a good start in the right direction. Moreover, there has been significant movement on this front since I first wrote about the human space program. We now have 14 national space agencies working together as the International Space Exploration Coordination Group (ISECG). They have recently released a Global Exploration Roadmap that focuses on the benefits to society of such a program.⁸

To implement our space philosophy, we must also go beyond the idea of a *program* to embrace the concept of a *movement*. I suspect that one of the reasons NASA does not get the support it deserves is that it has not emphasized opening up the space frontier for all people. Instead, it generally presents space exploration as a spectator sport. Taxpayers pay to watch others go into orbit or to the moon, but we do not get to go ourselves. Thus, the Human Space Movement would support a new kind of program that would be dedicated to the idea of space for all.⁹

Finally, an inherent aspect of this space philosophy should be not that it is only about moving into space but also preserving our home planet as a base of operations and as our home. We cannot abandon the Earth, nor can our efforts at space exploration be environmentally damaging to it.

We must avoid a different view of the future from the hopeful vision of the future exemplified by Star Trek and brought forth in a recent film called *Elysium*. It depicts a space settlement called Elysium where the wealthy live in luxury far above the planet, which is, in the meantime, deteriorating both ecologically and socially.

This is a vision that has no part in our space philosophy. The message of the Overview Effect is not simply that we should go into outer space and look back at the Earth. Rather, the message, repeated again and again by astronauts, is that we are *all in this together*. This refers to our life on Earth and our life in space. We must always remember a final key principle of a deep space philosophy, which is that *we are already*

⁸ For additional information, see <http://www.nasa.gov/exploration/about/isecg/#.UkBd6Y7eyAM>.

⁹ I have recently been working with Space Synapse Systems, a company that is attempting to foster such a movement under the "space for all" banner. Space Synapse is supported, in part, by a grant from the European Space Agency.

in space. The Earth is our first and most important spacecraft, and it must be preserved just as we would preserve an artificial spacecraft.

Summary

Humanity's greatest adventure—exploring the universe—lies before us. The time has come to put our space philosophy into action with a space program and space movement that are both worthy of this opportunity.

Let us boldly go....

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About the Author: Frank White is the author of *The Overview Effect: Space Exploration and Human Evolution*, first published in 1987 and re-issued in 1998. A member of the Harvard College Class of 1966, Frank graduated magna cum laude and was elected to Phi Beta Kappa. He attended Oxford University on a Rhodes Scholarship, earning an MPhil in 1969. He is the author or co-author of nine additional books, including *The SETI Factor*, *Decision Earth*, *Think about Space* and *March of the Millennia* (both with Isaac Asimov), *The Ice Chronicles* (with Paul Mayewski), *Space Stories* (with Kenneth J. Cox and Robbie Davis-Floyd), and *The New Camelot*. He also contributed chapters on the Overview Effect to four books on Space exploration: *Return to the Moon*, *Beyond Earth*, *Living in Space*, and *Space Commerce*. Frank is a member of the Board of Editors for *The Journal of Space Philosophy*.



Editors' Postscript: This is Frank White's third *Journal of Space Philosophy* article. He is one of America's top Space authors and philosophers and co-founded and co-directs the Overview Institute, which continues to capture astronauts' perceptions of Earth and the Cosmos. *Bob Krone and Gordon Arthur*.

UTOPIA: Space Philosophy and Reality

By Bob Krone, PhD

In the first issue of the Journal of Space Philosophy, Article 8, Fall 2012 (www.keplerspaceuniversity.com), we included a philosophy designed by the Board of Directors of Kepler Space Institute, titled “*PHILOSOPHY FOR SPACE: Learning from the Past – Visions for the Future.*” This is a follow-up article.

The summary of the philosophy we proposed in the Fall 2012 issue was:

“REVERENCE FOR LIFE WITHIN ETHICAL CIVILIZATION”¹

Why Reverence for Life within Ethical Civilization? Reverence for life is the foundational purpose that will sustain humankind in perpetuity. Ethical civilization will be the environment facilitating that end. The Policy Sciences hold the solutions for creating ethical and successful civilizations. These are the three essential foundation blocks of *The Philosophy for the Space Age*. Building these three basics will produce the highest probability for successful Space exploration, development, and human settlements plus the capture of Space resources for humankind’s needs on Earth and in Space within *The Law of Space Abundance*. Failure to build any one of these building blocks will destine humankind to permitting similar, or worse, mistakes and catastrophes than those that have plagued Earth’s societies throughout history. This is global leadership’s major challenge for the 21st Century.²

This follow-up article asks the question: “*Isn’t that Utopian thinking?*”

The best source for Utopian thinking is the classic book by England’s Sir Thomas More (1478-1535), *Utopia*, which was first published in 1517.³ It portrays an imaginary, ideal commonwealth in the early 16th Century. It has been studied for five hundred years. Why did Thomas More choose to create what he well knew was an ideal – and at the time impossible – social-political system? The short answer is “*Political Feasibility.*” Political Feasibility is the probability that your recommendations will be accepted by

¹ The author acknowledges profound respect for the life’s work of two classic scholars: 1) Dr. Albert Schweitzer (1875-1965), the 100th anniversary of whose publication of *The Philosophy of Civilization* will occur in February, 2023; and 2) Professor Yehezkel Dror (1928-present), the Co-Founder and primary scholar of *The Policy Sciences*.

² This formula for the Philosophy of The Space Age can be the launch pad for an infinite set of intellectual creations that define its execution in detail. For the purpose of this essay, I will focus on the philosophy of Albert Schweitzer (1875-1965) for reverence for life and the Policy Sciences of Yehezkel Dror (1928-present) for the governance guidance. Philosophy and Policy Sciences encompass huge literature sources available to Space Community scholars. The purpose of this essay is to stimulate interest and to launch research. That will be done with general concepts and basic design, not with detailed justification.

³ Sir Thomas More, *Utopia* (New York: Washington Square Press, 1965; first publication Paris: Gilles de Gourmont, 1517).

leadership.⁴ As the 16th Century began, European society's greed, decadence, the profligacy of the nobility – both political and religious – and the complete insensitivity of leadership to the misery and oppression of the poor had spawned Humanism. Humanism was a literary, scientific, and ideological movement, championed by Erasmus, that captured Thomas More. It has had a profound influence on global society ever since. Humanism was fundamentally Christian and challenged the educational system, the social conditions, and the authenticity of England and Western Europe's leadership. More's *Utopia* was a formidable reform document, but More realized that overt attacks on the existing leadership would be self-destructive. So, he created a completely imaginary future social-political system answering his own question: "*How is a wise man to seek remedies for the evils that he sees round him?*" He did it so well that leadership did not consider his work fiction and demanded that he, as Chancellor, sanction the Act of Supremacy. That Act was designed to preserve existing evils. More refused and was executed for treason on July 6, 1535. Political feasibility and More's convictions could not both be met.

So, is our design of a philosophy for the future of humans in Space a 21st Century repeat of Thomas More's *Utopia*? Is the expectation of Space settlements being based on a universal reverence for life and on ethical civilization as remote as the fundamentals of Humanism were to 16th- and 17th-century life? Viewing today's human existence on Earth reveals huge obstacles. But, we act on the belief that: "*When in doubt, choose optimism, then manage wisely to achieve a self-fulfilling prophecy.*" Pessimism is pathological. If a vision is for failure, failure will be the self-fulfilling prophecy.

We base our optimism on the characteristics of the modern Space Age, which have never existed on Earth. Discovery, science, technology, and invention have been persistent drivers of progress for humankind throughout history. The motives and applications of those discoveries and inventions reflect variations of good and evil. They are reasons for positive reversal from the pessimism existing in the 16th century. Christianity made the important change from antiquity's view of morality being that which is profitable and pleasurable to the belief that to be ethical and moral requires action promoting the welfare of others.

Another evolution of human thought was that individual action could produce gains, while passive inaction stalled progress. That thought took hold with some in the 18th Century. Since then that characteristic has grown to the point where discovery and invention occur not by decades or years, not by months or weeks, but now in the 21st century even within nanoseconds. Society is exponentially changing, producing paradigm shifts and making accurate predictions for the future less probable.

⁴ There are two Robert Krone journal publications on Political Feasibility: Robert M. Krone, "Political Feasibility and Military Decision-making," *Journal of Political & Military Sociology* 9 (Spring 1981): 49-60; Robert M. Krone, "Political Feasibility and the Manager," *The Bureaucrat* 10, no. 4 (Winter 1981/1982): 17-21.

The tragedies of history have occurred when ethical and moral thinking for the reverence for life was replaced by motives of power, control, manipulation, greed, and genocide. The 21st Century has begun without the eradication of human actions that can cause catastrophic events. Science and technology have brought humankind to the place where human behavior has an increasing capability of effecting human extinction. When the ethical foundation is lacking, most individuals, groups, governments, and corporations self-destruct and fail. Some survive for devastatingly long periods, like the Third Reich in Germany. But, Albert Schweitzer was right – without a foundation in ethics and reverence for life, civilization collapses.

There must be a natural life-affirmation, support, or endowment in human nature that has installed in humankind the will to live, to survive, to expand, to learn, and to progress. Without that in its genes, humankind would have gone extinct before now. Does the predominance of humankind's belief in progress both cause and continue discovery and invention? Is the satisfaction we feel from that action an important part of philosophy of life? We believe that evidence supports a "Yes" answer.

What has been missing too often in decision cultures is the inclusion of an ethical and moral foundation. Earth residents suffered human-caused catastrophes throughout the 20th century. Contemplate the results if those resources consumed could have been used to discover ways to prevent or ameliorate disease, hunger, poverty, or natural threats to humankind originating from our planet or from Space. Terribly unfortunate choices were made that were void of *Reverence for Life within Ethical Civilization*.

Policy Sciences Provides Solutions

Are we being naively optimistic and Utopian? How can *Reverence for Life within Ethical Civilization* be achieved in a world of diverse beliefs, values, conflicts, and visions? Doesn't the fact that it has never been universally adopted mean it is impossible?

Kepler Space Institute's answer is "***No. That is not an inevitable conclusion. Our World is radically changed, the universe holds the solution, and finding those solutions has high probability in 2013.***"

Ninety years after Albert Schweitzer's 1914 to 1917 writings in Africa were published, everything is different. Today ideas need not take decades to reach the public. They happen today with the speed of light. Science and technology have begun the Space Age, with humans experiencing Space for the last fifty years and now planning life in Earth orbit, on the Moon, and on Mars. Humankind's view of Planet Earth has been transformed.⁵

⁵ The best description of the worldview change due to the Space Age is by Frank White with his 1987 book, *The Overview Effect: Space Exploration and Human Evolution* (Boston, MA: Houghton-Mifflin, 1987).

The Policy Sciences have captured intelligence for completely new governance systems. Jonas Salk described the way in 1973 with his book *The Survival of the Wisest*.⁶ Professor Yehezkel Dror, in the preface to his book *The Capacity to Govern: Report to the Club of Rome*,⁷ states, "Radical redesign of governance is, therefore, required; otherwise, increasing social costs, even existence-threatening failures, are unavoidable." I invited Professor Dror to write a chapter in *Beyond Earth: The Future of Humans in Space*. His Chapter 5, "Governance for a Human Future in Space" was his first extrapolation of his life's research and extensive writings into Space. He begins that chapter with the sentence: "New forms of governance are essential for engaging in moving humanity beyond Earth."⁸ Dror describes humanity moving into a radically novel new epoch where living in Space is only one of its features. He sees that epoch as having a tremendous potential for better or worse:

On all of these levels much attention needs to be given to governance, because without restructuring governance, the movement of humanity into Space will remain a dream or, even worse, may take the form of nightmares becoming a dismal reality.

It's a recognized fact that humanity is entering a radically new epoch in which, for the first time in history, it has the power to destroy itself, by deliberate or unintended action. To prevent grievous harm resulting from this power and to use it for the better, radical improvements in critical future-shaping actors, processes, and institutions are essential, especially in the moral and cognitive qualities of rulers. And that fact is why we have included "*within Ethical Civilization*" in our proposed Kepler Space Institute Philosophy for the Space Age.

On April 21, 2008 Astrophysicist Stephen Hawking called for an era of Space conquest stating:

Spreading out into Space will have an even greater effect than Christopher Columbus' discovery of the New World. It will completely change the future of the human race and maybe determine whether we have any future at all.

⁶ Jonas Salk, *Survival of the Wisest* (New York: Harper and Row, 1973). Dr. Salk, who gave us the solution for polio, gives us the macro social solution for humankind. He states that human evolution is transforming from the survival of the fittest to the survival of the wisest in a manner similar to curves A and B of a Bell shaped curve. Human intellect and imagination will play the vital role for survival and evolution. Wisdom, as a new kind of strength, is a paramount necessity. Jonas saw individual and societal learning as the way to overcome barriers restricting the transformation to the survival of the wisest. With this essay Kepler Space Institute adds a new path to facilitate the evolution he prescribed in 1973.

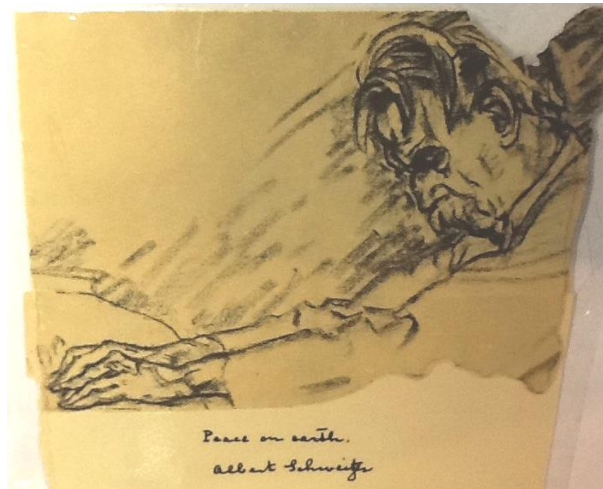
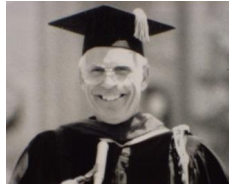
⁷ (London: F. Cass, 1994; 2nd ed. Abingdon: Routledge, 2001).

⁸ Yehezkel Dror, "Governance for a Human Future in Space," Chapter 5 in Bob Krone, ed., *Beyond Earth: The Future of Humans in Space* (Toronto, ON: Apogee Space Press, 2006), 41-45. Bob Krone and Yehezkel Dror have been professional colleagues since 1969.

The reality in 2013 is that the belief that Earth's humankind is in such a fatal decline that reverse thinking is Utopian, is wrong. We came from the heavens. "*We are Star Stuff.*"⁹ Answers lie in *Beyond Earth: The Future of Humans in Space*. Will decision-makers have the wisdom to create the research that finds those answers?¹⁰

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About the Author: Dr. Bob Krone is Co-Founder and Provost of Kepler Space Institute and Editor-in-Chief of *The Journal of Space Philosophy*. His 17-page Curriculum Vitae can be found at www.bobkrone.com/node/103.



⁹ See "*The Philosophy of Carl Sagan*", article 15 in this Fall 2013 issue of *The Journal of Space Philosophy*.

¹⁰ See *Space Research*, article 17 in this Fall 2013 issue of *The Journal of Space Philosophy*.

METALAW: From Speculation to Humankind Legal Posturing with Extraterrestrial Life

By George S. Robinson

A very longstanding question, relating to the disciplines of Natural Law Theory,¹ a variety of jurisprudential concepts, and, in the comparatively near rather than far future, an endless variety of positive laws implementing those concepts, is whether and how *Homo sapiens sapiens* should and will interact with extraterrestrial life forms. In certain situations, preparations for answers to this and related questions have been evolving over many decades, indeed, centuries. But first, a current reasonable definition of Metalaw is important to assessing any answer based upon present knowledge of what constitutes an “extraterrestrial.”

“Metalaw” Defined

Historically, Metalaw has been defined in several different ways in an evolutionary fashion as philosophical analyses regarding potential answers evolved and as empirical data accumulated giving a sharper and more focused understanding of what constitutes an “extraterrestrial”; also whether characteristics of “sentience”² are necessary to invoke the properties ascribed to Metalaw. Several relatively recent definition variations of Metalaw include the one Andrew G. Haley, currently referred to somewhat questionably as the creator or founder of Metalaw, introduced as his view of the concept in 1956.³ Haley considered Metalaw to represent a body of law developed to enable human communication with non-terrestrial life forms. He asserted that Metalaw referred to a basic theoretical legal precept, that is, it was a command meant as a rule of action or conduct applicable to *all* “intelligences,” human and extraterrestrial. The substance of Metalaw was what Haley and subsequently Dr. Ernst Fasan (an Austrian and visionary space lawyer) referred to as the “Interstellar Golden Rule,” namely, “Do unto Others as You Would Have Them Do unto You.” But as noted by the present author back in the late 1960s,

[w]ho, or what, determines that which is “injurious or hurtful to some other being?” If mankind is to make such a determination, it is of necessity one

¹ Natural Law Theory, or *jus natural*, is defined generally as being “derived from the philosophical speculations of the Roman jurists of the Antonine age and intended to denote a system of rules and principles for the guidance of human conduct which, independently of enacted law or of the systems peculiar to any one people, might be discovered by the rational intelligence of man, and would be found to grow out of and conform to his *nature*, meaning by that word his whole mental, moral, and physical constitution.” See Black’s Law Dictionary (1951), 1177. Clearly, over time from the Antonine age to the present, accumulation of empirical data relating to what constitutes nature and law has led to a more knowledgeable and predictable understanding of what constitutes *jus naturale*.

² For the purposes of the instant discussion, “sentience” is defined as having the capacity for feeling or perceiving consciousness; of having the capacity to perceive abstractly. See Webster’s New World Dictionary, Third College Edition (1998), 1223. It is important to realize that this definition can, and frequently does, change almost daily given the extensive research being conducted into psychoneurophysiological pathology.

³ A. G. Haley, “Space Law and Metalaw – A Synoptic View,” *Harvard Law Record* 23 (1956).

which is anthropocentric in nature. If an alien being is to make the determination, is not man deprived of some rights as an integral party? Or perhaps there is a compromise based on an understanding of all participants of the ultimate laws of nature permitting or tending towards a balanced universal ecosystem? If there is truth in the latter approach, again we must turn to the principle involved in Haley's Interstellar Golden Rule – do not disrupt unilaterally the ecosystem of an alien sentient being.⁴

Further, it was noted by A. C. Korbitz that

[i]t is clear the metalegal precepts Haley and Fasan proposed are squarely rooted in natural law theory and flow from Kant's Categorical Imperative in a largely deductive manner rather than being drawn empirically from actual human legal institutions in an inductive fashion. Despite this, Haley acknowledged the obvious anthropocentric limits of natural law theory but could not ultimately divorce Metalaw from this intellectual construct. This led former Smithsonian counsel... George Robinson to note that the cultural concept of rules or laws is itself anthropocentric... Robinson urged space lawyers, when engaging in metalegal research, to adopt an empirical approach similar to that used by cultural anthropologists. Robinson proposed an empirical analysis of Metalaw by studying human values formed with respect to totally alien concepts and potential situations, in particular "in al bio-ecological and cultural regimes wherein categories of relationships occur and may be distinguished."⁵

Refining the Concept of "Metalaw" Even More

In 1970, Dr. Fasan transitioned Haley's initial view of the concept more definitively, referring to it as the "entire sum of legal rules regulating relationships between different races in the universe." He considered it the "first and basic 'law' between races" that provided the ground-rules for a relationship if and when communications or an actual encounter occurred between humans and another intelligent race in the universe. Fasan envisaged these rules as governing both human conduct and that of extraterrestrial races in order to avoid mutually harmful interactions. Whatever the precise definition relied upon, it was a modern component of Natural Law Theory.

Haley and Fasan may be accredited with revitalizing the concept embraced by the term Metalaw within a more current context, particularly with the advent of the space age and the incipient stages of manned space exploration, migration, and long-term/permanent off-Earth habitation reflected, say, in the early stages of the International Space Station. Nevertheless, it might well be more appropriate to drift a bit farther back in history to find

⁴ G. Robinson, "Ecological Foundation of Haley's Metalaw," *J. British Interplanetary Soc.* 22 (1969): 266-74.

⁵ A. C. Korbitz, "A Brief Introduction to Metalaw," Paper and oral presentation at the Sept. 2010 International Institute of Space Law, International Astronautical Congress, Prague, Czech Republic. <http://metalawandseti.blogspot.com/p/brief-introduction-to-metalaw.html>.

the core principle of Metalaw... back to 1788, at which time Immanuel Kant formulated the “Categorical Imperative,”⁶ in which he proffered that each person should “act according to the maxim whereby you can at the same time will that it should become a universal law.” But what do the philosophic underpinnings of Metalaw show us in history? And would that history affirm the hint of empirically supported *secular* underpinnings of the intent of Metalaw?

“Metalaw” Antecedents: Questioning the Genesis Asserted by Haley

As noted earlier, the concept of Metalaw embodying certain predecessor aspects of the Interstellar Golden Rule is reflected in Aristotle’s cautionary principle that “We should behave to friends as we would wish friends to behave to us” and even in Confucius, who somewhat cautiously embraced the view that “What I do not wish others to do unto me, that also I wish not to do unto them.” The same urging is infused in very early religious “admonishments,” to wit, the Judaic Talmud asserting that “What is hurtful to yourself, do not unto your neighbor”; in Luke 6.31, the Bible admonishes just as anthropocentrically, without referring to extraterrestrial life for what may be obvious reasons, that “As you wish men to do to you, so also do you to them.” And then as Mohammed counsels, “Do good unto others as God has done unto thee.” In 1532, Francisco de Vitoria, a Spanish theologian, is well-remembered by many for his assertions in defense of the rights of Native Americans and others in the New World when interacting with colonists and explorers, namely, “People have the right to travel to any lands they desire subject to the restriction that they must not do harm to the natives residing therein.”

In more contemporary times, while “alluding” to human exploration of other celestial bodies and the “possibility” of encountering extraterrestrial life forms, the well-known and highly respected award-winning American science fiction novelist, Murray Leinster (1896-1975), stated in *The Aliens* (1949) in an obvious context that “[t]here could be no truce between men and a superior form of life.” In expanding on this concept in a more refined fashion, Andrew Haley’s 1956 publication on Metalaw asserted that in furtherance of the Interstellar Golden Rule “there may be no visitation whatsoever of any inhabited area until intelligible contact will have been made and the Authority has been satisfied that no physical or psychological hazards exists to either the explorer or the explored.” Again, two years later in 1958, Haley reaffirmed the basic tenet of Metalaw, namely, “it is better to destroy Mankind than to violate Metalaw,” a “view,” according to the present author, “that appears to retreat from any recognition of the biological foundations of *Homo sapiens sapiens*... and, indeed, all Earth indigent life forms giving evolutionary rise to modern humans.”

In 1962, Aldo Armando Cocca offered a refined ambivalence regarding an objective of Metalaw, namely, “[a]ny idea of aggression or conquest should be discarded – the mission of man when visiting other planets should evidence a high degree of civilization and a sense of legality.” Yet, again... even more homespun ambivalence to be applied

⁶ For excellent, but relatively abbreviated, discussions of what constitute variations of meanings of Kant’s Categorical Imperative, refer to http://www.qcc.cuny.edu/socialsciences/ppecorino/MEDICAL_ETHICS_TEXT/cha.

to an entity whose entire existence is based upon the biophysics of biochemistry. But this ambivalent admonishment of wishful thinking was addressed the following year by Haley when he stated that when exploring outer space and other celestial bodies, “[w]e may find inferior beings, and these we may keep from harming us by purely protective means.” This, of course, could mean anything from an “intelligent localized entity, or an infectious agent, such as certain equivalents of an Earth-indigent virus or bacterium. At this point, a careful and precise definition of “intelligent” in an equally precise context becomes critical.

In 1960, Julian G. Verplaetse seemed to embrace biological realism embodied in the fright, flight, or fight properties of the autonomic nervous system when he professed that

[i]f the planets are inhabited, sovereignty may be established only in two ways: By a victorious war or by agreement. War is and always will be the first origin and the *ultima ratio*. Sovereignty means power and ultimately military and technical power; whatever may be the means and ways. Agreement would be acceptance by inhabitants of the rule of the conquerors. The hypothesis of mutual sovereignty is practically excluded as the superior group would necessarily dominate... if the planets are not inhabited, the law would be accomplished by virtue of occupation. The planets would then be *res nullius* and the venerable custom and general principle of the law, according to which the effective possession and continuous occupation establishes sovereignty, would govern.⁷

This view has the appearance of a modern science fiction theme out of Hollywood, but it is a fair expression of the realities of the biological underpinnings of all societies. As noted in 1973 by Michael Michaud, former U.S. Deputy Assistant Secretary of State for Science and Technology and prolific author of space law related topics,

[o]ur basic interest will be to protect ourselves from any possible threat to Earth’s security. Our second concern would be to assist in developing or participate in a stable system of interstellar politics that provides an acceptable level of security for all. Our third concern would be to learn from the aliens in order to advance our knowledge of the universe and to add to the tools of civilization.

And then, in a somewhat surprising and ambivalent tone, R. A. Frietas, Jr., an attorney and researcher at the Xenology Institute in California and a strong supporter of the biological foundations and biochemical underpinnings of human behavior, seems to think “[w]e should leave other cultures entirely alone – let them evolve naturally, with no help or interference by outsiders.” That approach certainly has not been pursued in the evolution of interspecies cultures and civilizations (pre- and proto-hominid entities) on Earth. And who is to say that the ecosystem of Earth does not incorporate the

⁷ For this observation and other discussions regarding Verplaetse’s views relating to first contact with alien life forms, see R. Frietas, Jr., *Xenology: An Introduction to the Scientific Study of Extraterrestrial Life, Intelligence, and Civilization*, 1st ed. (Sacramento, CA: Xenology Research Institute, 1979).

ecosystems off-Earth... a kind of grand unity theory. The fact remains that several of the so-called lower orders of animals on Earth, such as the cetaceans, etc., have advanced forms of what even humans might call sentience.

Does Metalaw Really Matter in the Great Scheme of the Universe(s)?

Multiple views and arguments relating to Metalaw and its application to human space exploration, migration, and potential off-Earth settlement, have been presented by numerous individuals, both lay people and accomplished individuals representing a broad array of professions. The final expressions attempting to characterize the substance and goal of Metalaw as a unique jurisprudence with equally unique implementing positive laws remain ambivalent and almost less well-defined than what was offered in some ignorance by the likes of Aristotle, Kant, Confucius, Haley, and Fasan.

Interestingly, the U.S. National Aeronautics and Space Administration has supported for decades an Office of Planetary Protection, addressing both outbound and back contamination issues. The primary focus has been on the potential for harmful effects of, or interference with, exploratory programs intended to locate the existence... or *potential* for existence... of former, current, and presently-evolving carbon based life forms on other celestial bodies. Interference, or a compromising potential of related scientific experiments, has been the primary concern... but not exclusively so. Issues of what constitutes extraterrestrial life and what reflects earth-indigent life forms that mutate into harmful biota that are returned to Earth have not been given the kind of very serious consideration they should... more a political posture to avoid embarrassing or fiscally compromising questions from the public at large. Nevertheless, these issues are addressed by appropriate United Nations committees and subcommittees.

In one respect, it might be considered very unfortunate that the concept of Metalaw is not an integral component of the search for extraterrestrial life. As noted by S. W. Greenwood, and quoted by Frietas,

[t]he Great Rule of Metalaw proposed by Andrew Haley appears to have aroused surprisingly little critical comment. It seems to me to be a highly dangerous approach to the problem of how to behave in the presence of an alien intelligence. Literally it appears to direct an Earthman to do whatever an alien desires. What should be done when an alien desires an Earthman to hand over his vehicle, his equipment, and his crew? It is evident that the Rule of Metalaw would often be unworkable.⁸

But what likely will constitute the first “intelligent alien” with which *Homo sapiens sapiens* will interact? Here, yet again, we create confusion and ambivalence by the lack of *precise definitions* in equally *precise contexts*. Will it be an entity totally alien to Earth, with its genesis off-Earth? Will it be a biological entity that exists primarily in a space ambience off-Earth, but which finds its roots in the bush of evolution that took place... is

⁸ See *ibid.*, note 7 for a complete listing of his personally selected signposts regarding the evolution of the principles of Metalaw.

taking place... on Earth? What impact will the re-emergence of the Panspermia Theory⁹ have on the presumed genesis of Earth indigent life? Will it be a form of space-indigent humankind? A *transhuman*, perhaps? Even a totally independent biotechnologically-integrated post human of artificial intelligence *in extremis*?¹⁰ In this context, Dr. Rita M. Lauria has defined Metalaw as

an emerging juridical *science* that seeks to discover the basic tenets that can serve as guides to interaction with *any* intelligent life form in the universe. Because technology advances faster than jurisprudence can generally respond, it is reasonable for the global community to prepare fully for the consequences of scientific disciplines... as these may well alter our traditional legal definitions."¹¹

Transhumans, then, potentially subject to the tenets of Metalaw, might well be defined in a number of different ways. Nevertheless, a *transhuman* is generally treated as a biotechnological intermediary form between a human and the evolving biotechnological, fully independent, post human... both being descendants of humankind, of *Homo sapiens sapiens*, and still subject to evolving principles of Natural Law. For purposes of the instant discussion, a post human may be considered as the point of totally self-contained biotechnological integration having independent accountability under the law with respect to making decisions and commitment to corresponding activities... again, independently of its *transhuman* and human predecessors.

As noted previously by the present author,

Metalaw, like all existing and future domestic and public/private international space law, must be based upon the underlying philosophic construct of survival of the "essence," of the purpose and reason, of and for *Homo sapiens sapiens* and its biotechnological and fully technological descendants. Metalaw must always be considered "a work in progress," and not be constrained by humanistic and non-empirically defined principles of "wishful thinking." Humanistic forms of "faith" must always support a realistic embodiment of Metalaw in constant transition... or *Homo sapiens sapiens* and its descendants may well be retired from their secular odysseys in search of reason and purpose, much in the manner that its hominid ancestors became extinct.¹²

⁹ The Panspermia Theory suggests that life on Earth did not originate on Earth. The theory has been revitalized lately given the results of the ongoing search for extraterrestrial life forms.

¹⁰ In this context, see G. Robinson and R. Lauria, "Legal Rights and Accountability of Cyberpresence: A Void in Space Law/Astrolaw Jurisprudence," *Annals of Air and Space Law* 28 (2003): 311-26; R. Lauria and G. Robinson, "From Cyberspace to Outer Space: Legal Regimes under Pressure from Emerging Meta-Technologies," *33 U. La Vern L. Rev.* (May 2012): 219.

¹¹ See, in this context and generally, R. Lauria, "Metlaw," *Int'l L. J., Los Angeles County Bar Association* (Sept. 2012). Emphases added.

¹² In this context, see generally G. Robinson, "The Biochemical Foundations of Evolving Metalaw: Moving at a Glance to the Biological Basis of Sentient 'Essence,'" *Journal of Space Law, Nat'l Center for Remote Sensing, Air and Space Law, Univ. of Mississippi* (2013).

Is Metalaw Simply an Expression of the Rules of an Evolving Cybergame?

In the final analysis, perhaps Metalaw must embrace the fact that the known universe at present is but one complex interaction of *all* levels of energy, known and those yet to be empirically identified, quantified, and predictable in the form of organized information; and that Metalaw must be invoked when considering the components... carbon-based, organic and/or inorganic... of the universe as a single organism. Perhaps this is the real issue or question for those space jurisprudents seeking to “update and refine” the “game concept” reflected in the rules of Metalaw. Physicist Dr. Lee Smolin, at the Perimeter Institute of Theoretical Physics in Canada, may have a handle on the real motivator behind interacting with, or pursuing a redefinition of, extraterrestrial life and the applicability of the evolving principles incorporated in the concept of Metalaw. He argues in *Unification of the State with the Dynamical Law...* but not without peer criticism... that we must first “address the question of why particular laws were selected for the universe, by proposing a mechanism for laws to evolve.”

Finally, putting aside for the time the unanswered issues and questions regarding humankind’s legal posturing with extraterrestrial life, space lawyers focusing on the empirical foundations of Metalaw might give serious thought to the timeliness of Dr. Smolin’s introductory observation in *Unification of the state with the Dynamical law* that

Physics has for most of its history been primarily concerned with finding out what the laws of nature are. While we still do not have a completely unified theory of physics, our understanding of the laws of nature has advanced to the point where we are not only interested in what the laws are, but *why* these are the laws, and not others. [Emphasis added.]

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About the Author: Dr. George S. Robinson, III is one of the most distinguished Space Law experts in the world. His book, book chapter and professional article publications – over 100 – are found throughout the aerospace and Space literature and continue in 2013. He served as International Relations Specialist for NASA, legal counsel to the FAA, and legal counsel at the Smithsonian Institution in Washington, DC. He serves on numerous Boards of Directors for science research. Dr. Robinson was a strong supporter of the Aerospace Technology Working Group, which was the forum from which Kepler Space Institute and University emerged.



Editor's Notes: It has been a privilege to know, and work with, Dr. Robinson over the past ten years. He has been a professional Space Law contributor to the major Space Organizations and leadership. He was an author in the first two issues of the *Journal of Space Philosophy* and repeats here his message to global leadership linking the future of Space to humanity's survival. *Bob Krone, PhD.*

Cornucopia Mission: Going For the Low Hanging Fruit

By Robert L. Frantz and Michael Buet

KSI space philosophy suggests a pragmatic worldview using a wide-angle lens to observe the entire universe and its implications for humans on Earth. From our observations, we arrive at theories and one theory promoted by KSI suggests that Space can provide an abundance of wealth for the benefit of all humankind, as well as the answer to our over-population problems. Research clearly establishes that this wealth and the building blocks of a brand new Space civilization can be found on asteroids, moons, and planets in the form of valuable resources for Earth such as platinum, gold, and diamonds. Based upon hard data gathered from meteorites, which are the remains of asteroids that managed to reach Earth's surface, experts estimate that asteroid regolith composition should match or exceed the Moon's regolith contents in silicon, aluminum, calcium, iron, and magnesium oxides. According to their estimations, a 1 km diameter asteroid should contain more gold and platinum-group metals (PGMs) than have ever been mined on Earth.

The next question is: How do we operationalize this theory into reality? Moreover, we must also consider the vast implications associated with mankind's expansion into Space: The Earth population is currently increasing at a frightening geometric rate – world population as of September 6, 2013 at 10:30 am Eastern Time was 7,168,395,698¹ and counting, slated to top the 10 billion mark perhaps as early as 2025, but certainly by 2050. By all experts' accounts, we will have exceeded the Earth's fresh water and food production capabilities within that period, with unavoidable results: Wars, famine, and pandemic diseases.

This could cause the rapid, abrupt demise of our entire Western civilization, which in turn would wipe out all the accumulated scientific treasure-trove from which we now benefit. The current occupant of Newton's Chair at Cambridge, Stephen Hawking said: "I don't think the human race will survive the next thousand years, unless we spread into space. There are too many accidents that can befall life on a single planet. But I'm an optimist. We will reach out to the stars."² But our time is running out – We MUST open Space for mankind to expand into now, or suffer the consequences: In just a few years, if we don't act now, we could possibly lose the ability even to launch rockets to Space.

However, there is hope: We have the technology right now to go out and start the Space Gold Rush. Just like the '49ers, we can now go out there and harvest the endless riches of Space. We can use space-based resources to build space structures in space, designed only for space use, free of the exacting and very costly engineering requirements of rocket launches from deep within the Earth's gravity well. We can extract all we need to survive in space from the Moon, the asteroids, and Mars and we can do it right now, before it is too late. We have everything we need today to go out

¹ www.prb.org.

² http://refspace.com/quotes/Stephen_Hawking.

and harvest the endless supply of raw materials needed to build gigantic space habitats, which would have the capability of providing idyllic living conditions for millions of people, located at the multiple Lagrange points around the Earth and the solar system. All this will require a steady supply of large amounts of raw regolith.

There are three companies now actively pursuing realistic asteroid mining. One is Planetary Resources, whose objective appears to be to go survey first, then corral asteroids and move them to Moon orbit for further exploitation, using “tomorrow’s” technologies. They also appear to have an underlying goal of claiming asteroid ownership rights by simply landing their numerous inexpensive observation/survey cube-sats on as many NEAs as possible. We believe that this goal will receive serious international scrutiny and opposition in view of both the existing international treaty on space exploration and simple common sense.

The second company is Deep Space Industries, with similar plans to Planetary Resources to survey, then re-route and exploit entire asteroids in cis-lunar orbit or at Lagrange points, again using “tomorrow’s” technologies. However, neither has published their plan on how they plan to return the materials to Earth for processing.

Both these companies plan to re-route entire asteroids towards Earth into cis-lunar orbits or Lagrange points, and then send astronauts out there, something that has not been done in 50 years, and keep them there for extended periods of time. This will be exposing them fully to deadly cosmic radiation and solar flares.

Many experts also question the wisdom of aiming entire asteroids, however small, in the general direction of Earth.... We have witnessed just how much damage even a very small one can cause at Chelyabinsk – and that one did not even reach the ground.

The third company, started by the authors of this paper, is Kepler Energy & Space Engineering (KESE),³ which proposes a simpler, more direct and more cost-effective approach using current space-proven hardware and technology. KESE can start to launch the Cornucopia Mission now. Its mantra is “keep it simple”. KESE will be in a position to provide both PR and DSI companies with fully shielded spacecraft and space habitats that can be moved to cis-lunar orbit for their projects when they are ready to send their astronauts to cis-lunar orbit.

Over and beyond the very significant long-term payoffs to Investors implied in all the above asteroid and Moon/Mars mining and the enormous benefits to Earth in general, KESE aims to provide mankind with the only possible escape valve from the incoming overpopulation and resulting wars, famine, and pestilence, which would signify the end of Western civilization as we know it today. The KESE business model also includes a very significant immediate ROI component from the start of the hardware build on Earth all the way through the entire mission by offering and inviting the Internet public at large

³ www.kesellc.com.

to participate in this (literally) out-of-this-world project first-hand via exclusive mission access deals with service providers.

The KESE business model is based upon a thorough academic feasibility study vetted by renowned Space engineering authorities and academics, which clearly demonstrates that existing space-proven technologies are available right now for successfully flying to and from asteroids, using a very simple, very basic mining technique for the extraction of asteroid regolith. The ore will be brought back to LEO as a fine regolith powder contained in four relatively small return vehicles (RV), capable of carrying only ~10 tons/each, which would be incapable of causing any harm to Earth even in the worst case: If proper re-entry angle for LEO insertion is not achieved, the RV will either bounce off harmlessly into space or its thin outer casing will immediately disintegrate against the upper layers of the atmosphere and the fine asteroid powder within the disintegrating cylinder will just volatilize into a large puff of smoke.

Once the four separate return vehicles are in LEO, exploitation of the valuable resources that all asteroids possess can start inside the shield of Earth's magnetic field (the inner Van Allen belt), which protects astronauts from deadly cosmic radiation and solar flares. Performing all manned space operations in LEO, only 250 miles from Earth support, will be much easier and a lot safer than performing the same tasks in deep-space 240,000 miles (400,000 km) from Earth, fully exposed to deadly cosmic radiation and dangerous solar flares.

An example of what valuables can be extracted from asteroid regolith is platinum, a scarce resource on Earth, but plentiful on such bodies as asteroids and moons. Platinum, on the U.S. market, sells for about \$55,000 an ounce. It has been demonstrated by detailed meteorite studies that ~10% (or more...) of asteroid regolith can consist of platinum group metals (PGMs). Each ton of regolith returned to an orbiting workstation could produce up to 3 or 4 kg of platinum and gold. Over and beyond that, we now can use regolith powder directly "as-is" to 3D-print our shielding "bricks" in LEO, as was shown by experiments conducted at Washington State University.⁴

With the current paradigm shift towards the commercialization of space, NASA and conventional aerospace corporation engineers and scientists are now shifting from government-sponsored jobs to civilian jobs. New actors are also involved, such as very wealthy entrepreneurs who are using DBAs, MBAs, and CPAs to crunch out business plans that have demonstrated to their satisfaction the staggering potential for asteroid and moon mining to achieve fabulous returns on investment despite the high launch expenses and risks. Actually, when all else is computed in, these do not significantly differ from Earth-based long-term investment costs and risks, with significantly higher potential returns.

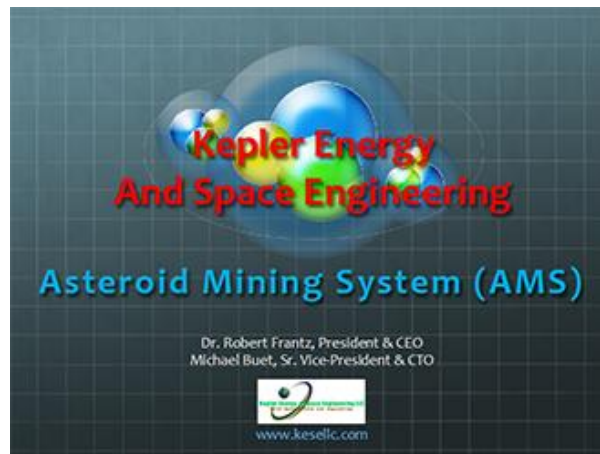
⁴ <http://www.space.com/18694-moon-dirt-3d-printing-lunar-base.html>.

Besides the academic feasibility study, KESE has produced a comprehensive business and marketing plan. A scaled prototype model of the Cornucopia Automated Mining System and of a complete model made from the KESE radiation-protection outer-shield elements of space habitats and spacecraft are being developed using a 3D printer.

Initial funding of \$1M is being sought by KESE to complete its planned-for proof of concept feasibility study by top scientists and experts, which will provide all Cornucopia Mission investors with the due diligence for funding the entire Project.⁵

Space is truly our “Final Frontier.” It can become our reality of tomorrow, for our children, and for our children’s children. Once started, this new Space civilization will not need to rely on Earth-based resources: On the contrary, it will be designed to be self-sufficient from the start, as well as providing Earth with a much-needed outlet for its population and it will supply all its own basic materials as well as returning as much of it as is needed down to the Earth’s surface. It can also start providing the world with as much free solar and H₃ fusion energy as it needs.

The few individuals savvy enough to invest early in this new Gold Rush will greatly benefit from a relatively low level of investment.



⁵ Available now to qualified Investors. Write to bob@kesellc.com or Michael@kesellc.com for information.



KESE's Keys to Success!

- Use KIS=Keep It Simple
- Go for Low Hanging Fruit
- Use Current Space-proven Technology and Hardware
- Provide Quickest Return On Investment to Investors



LOW HANGING FRUITS: AVAILABLE NOW

- Over 2,000 known Near Earth Objects within possible reach from Earth with our Automatic Asteroid Mining System
- Over 10,000 already mapped by JPL



The graph, titled "Known Potentially Hazardous Asteroids Near Earth", shows the cumulative number of NEAs and PHAs discovered from 1990 to 2010. The NEAs curve rises steeply, reaching approximately 2,000 by 2010. The PHAs curve rises more gradually, reaching about 1,000 by 2010. A legend indicates that the NEAs curve is based on data from the NEOS Survey and the PHAs curve is based on data from the NEOS Survey and the NEOS Survey.



Use Current Technology and Hardware

- Simple "no-frills" with multiple Fail-Safe/Four Independent Return Vehicles
- Use current Commercial Launch Capability
- Use current proven Navigation and flight control hrdwr (DAWN/HYABUSA)
- Use simplest possible Mining Technique
- Use well-tested NASA Recovery System
- Easy PGMs/Metallics/Minerals Processing once back on Earth and/or in LEO



The slide includes three images: a lander with legs, a probe with a camera, and a satellite in orbit. The satellite image is labeled "HEART" and "HEART is a CubeSat-based, 1U size, 1U size".

Keep It Simple! Keep it SAFE!!



- **Advantages of KESE over NASA, Planetary Resources and Deep Space Industries Projects:**
 - ✓ They Require Unproven, Undeveloped, Unusable, Costly & Unreliable Technology
 - ✓ Launching an entire Asteroid in the Direction of Earth is a Risky Proposition...
 - ✓ All these Projects Require Mining to Build Deep Space Colonies, Radiation Outside the Van Allen Belts, Equivalent to keeping HADES a nuclear reactor
- ✓ KESE will be Ready to Provide Radiation-safe Support Vehicles for Other Manned Projects Located Outside the Van Allen Belt/Cis-Lunar Orbits (~239,000 MILES FROM EARTH) for a Fee

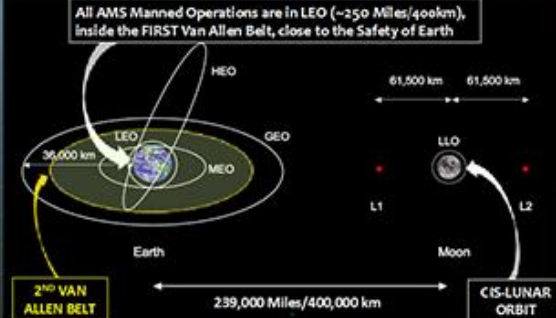
All AMS Manned Operations are in LEO (~250 Miles), inside the FIRST Van Allen Belt, close to Earth



— Low Earth Orbit (LEO)
— Indicates the extent of Van Allen radiation belts
 — 30.6% of distance to the Moon
 EARTH-MOON DISTANCE: 238,900 MILES

Keep It Simple! Keep it SAFE!!

All AMS Manned Operations are in LEO (~250 Miles/400km), Inside the FIRST Van Allen Belt, close to the Safety of Earth




2nd VAN ALLEN BELT

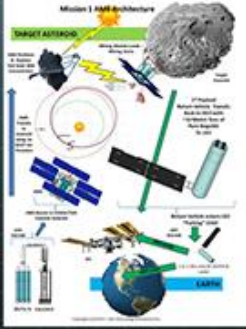
239,000 Miles/400,000 km


CIS-LUNAR ORBIT

Fast Return On Investment




- ◆ **Faster than other approaches with High Returns: Why?**
 - ✓ Use almost exclusively Space-proven Technologies and existing flight-proven hardware systems: Can build and launch NOW
 - ✓ Straight-forward Flight Plan:
 - + Go there as fast as possible,
 - + Harvest ~40 tons of payloads as fast as possible
 - + Return payloads to LEO as fast as possible



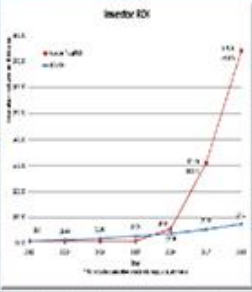


Gold at the End of the Rainbow?




Asteroid Regolith: Why needed?

- Regolith provides effective radiation and micro-meteorite shielding material for deep-space exploration space ships built in LEO.
- Asteroid Regolith contain estimated 10% or more PGM: On-board spectral and x-ray analysis can identify mineral rich asteroids
- A 1 km radius asteroid is estimated to contain more gold and PGMs than have ever been mined out of Earth since the beginning of time.




What Can we Do with Asteroid Regolith in LEO?

- Use the Asteroid Regolith "AS-IS" with a 3D Printer to manufacture Interlocking Cosmic Radiation Shield "Bricks" to manufacture the outer-shell for Space Habitats and Manned Deep-Space Spacecrafts
- Asteroid Regolith contain estimated 10% or more PGM: Extract PGMs and Metallics in LEO to use in manufacturing parts and components for the Space Habitats and Spacecrafts
- Finance LEO Operations by sending PGMs for ROI on Earth as needed



CURRENT PGM COMPONENTS MARKET VALUE (as of 8/20/2013)

Precious Group Metals Value (8/20/13)	Price/kg
RHODIUM (Rh)	\$38,259
PALLADIUM (Pd)	\$25,173
SILVER (Ag)	\$836
RHENIUM (Re)	\$11,250
OSMIUM (Os)	\$12,000
IRIDIUM (Ir)	\$25,720
PLATINUM (Pt)	\$50,765
GOLD (Au)	\$44,801



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About the Authors: Robert L. Frantz, PhD, is the President and CEO of Kepler Space Institute. He has careers as a pilot in both military aviation – United States Marine Corps – and United States Civil Aviation. After those careers, he founded Ashburn Institute and became expert in online education: bob@kesellc.com



Michael Buet is Chief Technical Officer of Kepler Energy and Space Engineering, LLC. An EE/ME – Lean/Six-Sigma Black Belt & SCRUM Master, co-author of the Cornucopia Mission scientific paper (posted on www.kesellc.com), Michael has extensive diversified Aerospace and semiconductor industry experience. He is also currently active in space conferences, and assists in educational programs of Kepler Space Institute: michael@kesellc.com

Editors' Postscript: Space activity made an historic transition over the past fifteen years – from totally government programs to private industry. The change has profound, and permanent, positive impacts for the evolution of Space exploration, development, and human Space settlements. Asteroid mining has jumped to the top of the high-return-on-investment Space enterprises. The combined skills of Dr. Robert Frantz and Michael Buet have taken them from philosophy and theory to this specific proposal for capturing the known resources of asteroids for Earth needs. *Bob Krone and Gordon Arthur.*

Space Business and Management

By Thomas H. Olson

Having spent a career teaching and consulting Business and Management in higher education, I find the challenges for human settlements in Space, documented in *Journal of Space Philosophy* publications, reasons for a re-examination of higher education curricula for Business and for Management. The following statement of Professor Yehezkel Dror, founder of The Policy Sciences, in his Chapter 5, "Governance for a Human Future in Space," in *Beyond Earth: The Future of Humans in Space* (2006), edited by Robert M. Krone, is a perfect summary of the need:

Dreaming about the human settlement of space that leads to realistic visions increasingly shared by humanity as a whole, and by influential elites in particular, is essential for making human movement beyond Earth a reality. Systematic and realistic thinking on how to accomplish such realistic visions is a next essential step, to be followed by modular implementation. On all these levels much attention needs to be given to governance, because without restructuring governance, the movement of humanity into space will remain a dream or, even worse, may take the form of nightmares becoming a dismal reality.¹

And the Kepler Space Institute's (KSI) proposed Space Philosophy, in Dr. Krone's article 8, of the Fall 2012 *Journal of Space Philosophy*, titled *Space Philosophy: Lessons from the Past – Visions for the Future*, provided me additional motivation for this article. That philosophy is summarized as:

Why Reverence for Life within Ethical Civilization?

1) Reverence for life is the foundational purpose that will sustain humankind in perpetuity. 2) Ethical civilization will be the environment facilitating that end. 3) The Policy Sciences hold the solutions for creating ethical and successful civilizations. These are the three essential foundation blocks of *The Philosophy for the Space Age*. Building these three basics will produce the highest probability for successful Space exploration, development, and human settlements, plus the capture of Space resources for humankind's needs on Earth and in Space within *The Law of Space Abundance*.²

And Dr. Krone's article in this issue of the Journal, titled "*Utopia: Space Philosophy and Reality*" is further clarification of 1) radical needs, 2) Space resources, and 3) the huge

¹ Robert M. Krone (ed.), *Beyond Earth: The Future of Humans in Space* (Toronto, ON: Apogee Books, 2006), 45.

² Robert M. Krone, "Philosophy for Space: Learning from the Past – Visions for the Future," *Journal of Space Philosophy* 1, no. 1 (2012): 17-18.

gap between humanity's management history and the philosophy and visions presented.

For this article I accept the philosophy and visions KSI has presented to date as the optimum for successful Space exploration, development, and human settlement. Feasibility analysis for those visions I will leave for others. My purpose, given that assumption, is to itemize the categories of Business and Management university curricula that will need radical alterations to commit fully to those visions.

And for this short article I will also merely list those academic subjects for which new definitions, tools and practices will be needed:

- Information technology and management.
- Leadership: especially moral and ethical leadership.
- Boards of directors: design, management, and process.
- Business and management methodologies.
- Human resources management.
- Human and machine advanced intelligence research.
- Research across the business and management fields.
- Biological, psychological, and neurological research and health care.
- Entrepreneur performance evaluation.
- Environment analysis.
- Profit and cost-benefit analysis.
- Strategic planning & management.
- Investment, equity, & debt: short-term & long-term.
- Decision and management processes.
- Markets and growth.
- Financial systems and financial feasibility.
- Economics: Production, distribution, and consumption of goods and services.
- Project management.
- Capturing, managing, and applying brainpower.
- Forecasting and contingency planning.
- Business and management consulting.

Readers will immediately grasp that I am providing here a heuristic first listing of business and management subjects needing re-thinking and that those subjects are illustrative of the major subjects of traditional university Business and Management degree programs. And returning to the writings of Yehezkel Dror, it is clear that successful human transitions to Space cultures will require radical changes in existing government, business and management. Re-thinking for those changes must fit the "*Breakthrough Thinking*" criteria³. They will also require huge intellectual and brainpower inputs, as is now well documented within the Space literature.

³ I am fortunate to be on the Faculty of the University of Southern California, which has been a pioneer for *Breakthrough Thinking*, particularly by Dr. Gerald Nader, President of the Center for Breakthrough

I am pleased by the vision of the leadership of KSI to create the first Space University in the United States to address these business and management challenges along with the other science, technology and education challenges.

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About the Author: Thomas H. Olson, DBA/PhD is Professor of Clinical Management and Organization, Marshall School of Business, University of Southern California (USC), Los Angeles, California, USA. He is a member of the Board of Editors of *The Journal of Space Philosophy*.



Editors Postscript: We are grateful to Dr. Olson for giving us the first article in our *Journal of Space Philosophy* issues to acknowledge the business and management education tasks to be addressed. We study philosophy to find the best reasons for humanity's move to Space. Governance, Business and Management will be the tools needed to accomplish the transition to the Space Age effectively and efficiently. *Bob Krone and Gordon Arthur*.

Thinking and Chair Emeritus of engineering Management at the University of Southern California. See his book, co-authored by Shoo Hibino, PhD, *Breakthrough Thinking: The Seven Principles of Creative Problem Solving* (Roseville, CA: Prima, 1998).

The Philosophy of Carl Sagan

By Bob Krone, PhD

Carl Sagan searched for worlds “*fabulously unlike Brooklyn*” since at age nine, in 1942, he was fascinated by the adventures on Mars created by Edgar Rice Burroughs.¹ That began his interest, followed by his career as astronomer, astrophysicist, exobiologist, Director of Cornell University’s Laboratory for Planetary Studies, and Professor of Astronomy and Space Sciences. He was a best-selling author – twelve books and 400 journal articles.

In 1979 and 1980 he created *Cosmos: A Personal Voyage*, the thirteen-part television series, and the book, that brought fifteen billion years of the origin of the Earth and the universe to people in understandable language – when Space scientists were talking in a language only known to each other. And Carl’s message that “*something incredible is waiting to be known*”² got the public’s interest in extraterrestrial life and intelligence.

His conviction that “*there must be other starfolk*” and that there must be other planets with something like the processes that led to life on Earth and that there must have been some life form on Mars stayed with him until his death on December 20, 1996. Sagan had an irresistible need to search for life in the universe: “*The most exciting thing we can find in science is life on another planet.*”

I believe the one place that captures Carl Sagan philosophy best is his summary statement, page 333, in *Cosmos*:

There is no other species on Earth that does science. It is, so far, entirely a human invention, evolved by natural selection in the cerebral cortex for one simple reason: It works. It is not perfect. It can be misused. It is only a tool. But it is by far the best tool we have, self-correcting, ongoing, applicable to everything. It has two rules. First: there are no sacred truths, all assumptions must be critically examined; arguments from authority are worthless. Second: whatever is inconsistent with the facts must be discarded or revised. We must understand the Cosmos as it is and not confuse how it is with how we wish it to be. The obvious is sometimes false; the unexpected is sometimes true. Humans everywhere share the same goals when the context is large enough. And the study of the Cosmos provides the largest possible context. Present global culture is a kind of arrogant newcomer. It arrives on the planetary stage following four and a half billion years of other arts, and after looking about for a few thousand years declares itself in possession of eternal truths. But in a world that is changing as fast as ours, this is a prescription for disaster. No nation, no religion, no economic system, no body of knowledge, is likely to

¹ “Seeking Other Worlds,” *Newsweek*, September 5, 1977, 32.

² See the Carl Sagan Web Site and Foundation, www.carlsagan.com.

have all the answers for our survival. There must be social systems that work would work far better than any now in existence. In the scientific tradition, our task is to find them.³

In that half-page, Carl gives us his philosophic thoughts about human uniqueness and human weaknesses; about science and the Cosmos; about inadequate perceptions about the Cosmos; about Earth's human culture arriving so recently in planetary history; about that culture's ability to find answers; and about the need to find better ways to manage and control society.

And his overall message to society:

We are fortunate: we are alive; are powerful; the welfare of our civilization and our species is in our hands. If we do not speak for Earth, who will? If we are not committed to our own survival, who will be?⁴

I have a personal reason for including Carl Sagan's beliefs and thoughts in our *Journal of Space Philosophy*. In 1979, when he was creating *Cosmos*, he was also convincing NASA that its knowledge and applications of computer sciences needed upgrading. Robert A. Frosh, NASA Administrator, decided that a NASA/IEEE 1980 Summer Research, titled "*Advanced Automation for Space Missions*," would occur at the University of Santa Clara in California. The task was to define *Advanced Machine Intelligence* and then four teams of researchers would apply that definition to missions planned for the future of NASA.

The teams were: 1) Terrestrial Applications; 2) Space Exploration; 3) Non-Terrestrial Utilization of Materials; and 4) Replicating Systems Concepts. The research group was composed of fifteen NASA Center Program Engineers and eighteen university professors with advisement by thirty computer industry and aerospace industry experts. I came from the University of Southern California and became chair of the Space Exploration Team. Dr. Joel Isaacson came from the Department of Mathematics and Computer Science at Southern Illinois University. He was the primary scholar to define advanced machine intelligence for the group. The next year, in 1981, he patented his discovery of an *Autonomic String Manipulation System* in nature.⁵ The fundamentals of that discovery are defined in his feature article, "*Nature's Cosmic Intelligence*" in the first *Journal of Space Philosophy*, Fall 2012. Dr. Marc van Duijn's article in this issue, Fall 2013, provides his own cognitive intelligence research consistent with the Recursive Distinguishing (RD) foundation of the Isaacson discovery.

That summer, 1980, NASA research launched me into the Space Community and Dr. Isaacson and I have been colleagues and friends now for thirty-three years. I believe

³ Carl Sagan, *Cosmos: A Personal Voyage* (New York: Random House, 1980), 333.

⁴ *Ibid.*, 320.

⁵ J. D. Isaacson, *Autonomic String-Manipulation System*, US Patent 4,286,330, issued August 25, 1981, <http://www.iss.org/2001meet/2001paper/4286330.pdf>.

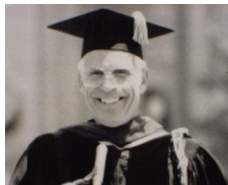
history will record that the Isaacson discovery ranks with those of Newton and Einstein. Carl Sagan was the driver for those 1980 beginnings.

Imagination will often carry us to worlds that never were. But without it we go nowhere.... Personally, I would be delighted if there were a life after death, especially if it permitted me to continue to learn about this world and others, if it gave me a chance to discover how history turns out. (Carl Sagan)



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About the Author: Dr. Bob Krone is Co-Founder and Provost of Kepler Space Institute and Editor-in-Chief of *The Journal of Space Philosophy*. His 17-page Curriculum Vitae can be found at www.bobkrone.com/node/103.



Bigger and Hotter Rockets and their Consequences

By William Mook

Moore's law in electronics proceeds from an analysis of the fundamental cost drivers in integrated circuit production, which boils down to cost per feature, or cost per circuit in terms of wafer real estate. Are there fundamental laws that drive the cost of interplanetary travel? The answer to that question is yes. This "Mook's" law boils down to cost of momentum, or cost of lift, in terms of delta vee. As the cost of lift falls, the mass flow rate over a given delta vee for a given number of dollars per year increases.

Since the delta vee for minimum energy transport around the solar system from Earth's surface is well-defined, the cost of material flows between worlds can be predicted for a given momentum cost. The volume and cost of these flows can then be estimated and from that a development plan evolved.

Over the first 20 years of spacefaring development (1946 to 1966) we saw the following development of chemical rocket technology;

1946 V2	1.0 T payload	12.5 T takeoff weight	5.76 km/sec	239 lsp	\$3.0 billion
1956 R7	2.0 T payload	267.0 T takeoff weight	9.20 km/sec	306 lsp	\$4.5 billion
1966 S5	45.0 T payload	2,800 T takeoff weight	10.85 km/sec	420 lsp	\$6.5 billion

The rockets get bigger and hotter to reduce the cost of momentum. We go through the following development arc:

- (1) Small suborbital payloads;
- (2) Moderate orbital payloads;
- (3) Large cislunar payloads.

Space-Based Paradigm Shifts for Earth

Since all people on Earth with minor differences bear the same relationship to the cosmos, any cosmic development off-world affects all those on Earth's surface equally. So, it is natural that the result of rocket development results in global paradigm shifts as well as the creation of global delivery of products and services.

Our development arc in bigger hotter rockets therefore resulted in the following global paradigm shifts:

- | | | | | |
|-------------|---|--------------------------------|---|-------------------------------|
| (1) ICBM | → | Mutual assured destruction | → | Uneasy global peace |
| (2) Sputnik | → | Communications satellites | → | Global communications/sensing |
| (3) Apollo | → | Photo of whole Earth from Moon | → | Environmental movement |

Still-born, and under-reported, were what can only be termed the "spiritual" insights of early explorers, which is rather amazing among a group of hard-boiled scientists, engineers, and military jocks. Reports of Samadhi were common. For example, Edgar

Mitchell founded the Noetic Institute to promote his insights to the world. Al Bean became an artist to communicate his vision. Charles Duke became a minister.

It should not be surprising to find that sending large numbers of people deep into space across the solar system results in insights that we could call religious in nature.

In November 1963, the first meeting the newly installed President Johnson had at the White House was with Robert McNamara. He reviewed the proposed NASA budget for 1964. That budget year saw a shift as America's bold adventure in space became a manned moon program. This resulted in the abandonment of nuclear propulsion efforts as well larger, hotter chemical rockets. A focus on the moon was accentuated and the development of bases and other capabilities beyond the moon landing were abandoned.

What could we expect if development had not been curtailed in 1964 budget year? Well, NERVA and ROVER programs might have borne fruit. Also, nuclear pulse programs like the first Orion program might also have borne fruit, as Freeman Dyson wrote in a Science article in 1964.

Nuclear Pulse propulsion would certainly meet the larger and hotter engine criterion.

These advanced propulsion programs carried out in the 1960s would likely have cost less than the space shuttle and would definitely have given us industrial access to the solar system. So, we add a fourth step to our growth curve, one for 1976 at a cost of \$10.1 billion.

(4) Orion → Nuclear Pulse → Disarmament & Solar Power Satellites

The ability to beam laser and maser energy from space, generated by tapping into abundant sunlight far from Earth, naturally leads to ion rockets and beamed thermal rockets to expand upon the high temperature technologies explored first with nuclear technologies. At that size and temperature, the cost of materials retrieved from the solar system falls to price points associated with ocean travel and the mass-flow rates increase accordingly. Thus, propulsion more than anything else leads to off-world mining. This begins with mining rare Earths and low volumes of materials that are exceptionally rare here and moves toward more common materials as prices fall. Large power satellites reduce the cost of energy. As the cost of energy declines, the cost of extracting materials from regolith generally rather than ores becomes cost effective. Materials may also then be extracted from waste material cost-efficiently, reducing the mass flows needed to sustain high standards of living. This was recognized by NASA scientists back in the 1970s, who originally outlined this development cycle and coined the term Demandite.

So, along with an increased sensitivity toward our environment due to the photo of the whole Earth from space, there is an increased capability to live lightly on the Earth and make greater use of off-world resources to preserve our environment.

The ability to beam power in copious quantities to both stationary and moving targets from space not only provides a means to defend against missiles, but also a means to provide low-cost laser propulsion generally, allowing individuals access at lower cost to the same development arc afforded weapons in the 1940s and satellites in the 1950s. The personal ballistic vehicle will have arrived along with on-demand flight to any point on Earth in a matter of minutes and eventually the development of orbital residences. These are expected to cost \$15.2 billion for ballistic transport around Earth and \$22.8 billion to develop the infrastructure to permit an orbital capability on demand for everyone.

(5) Laser propulsion → Low cost ballistic transport → Global transport network

(6) Low cost laser → Low cost space access → Global real-estate in space

Expanding capabilities in space mean that power satellites operating inside the orbit of Mercury can be developed. These satellites are capable of beaming energy across the solar system, providing another radical reduction in the cost of energy and an increase in the amounts of energy humanity handles. This leads naturally to missions beyond 660 Astronomical Units, using laser light sails and a new innovation that recycles photons called the photonic thruster. This last innovation permits the efficient use of laser light sails at very low speeds, yet maintains relatively high efficiency. At 660 AU the gravity field of the Sun itself is used to survey the 100 stars within 32 light years of Earth in advance of missions to these stars. These observatories are also the places where energy is beamed to the star and focused by the sun's gravity very efficiently, permitting long distance light sail and even photonic thruster operations. This leads to the final step in the next decade of development, star travel, for \$34.2 billion.

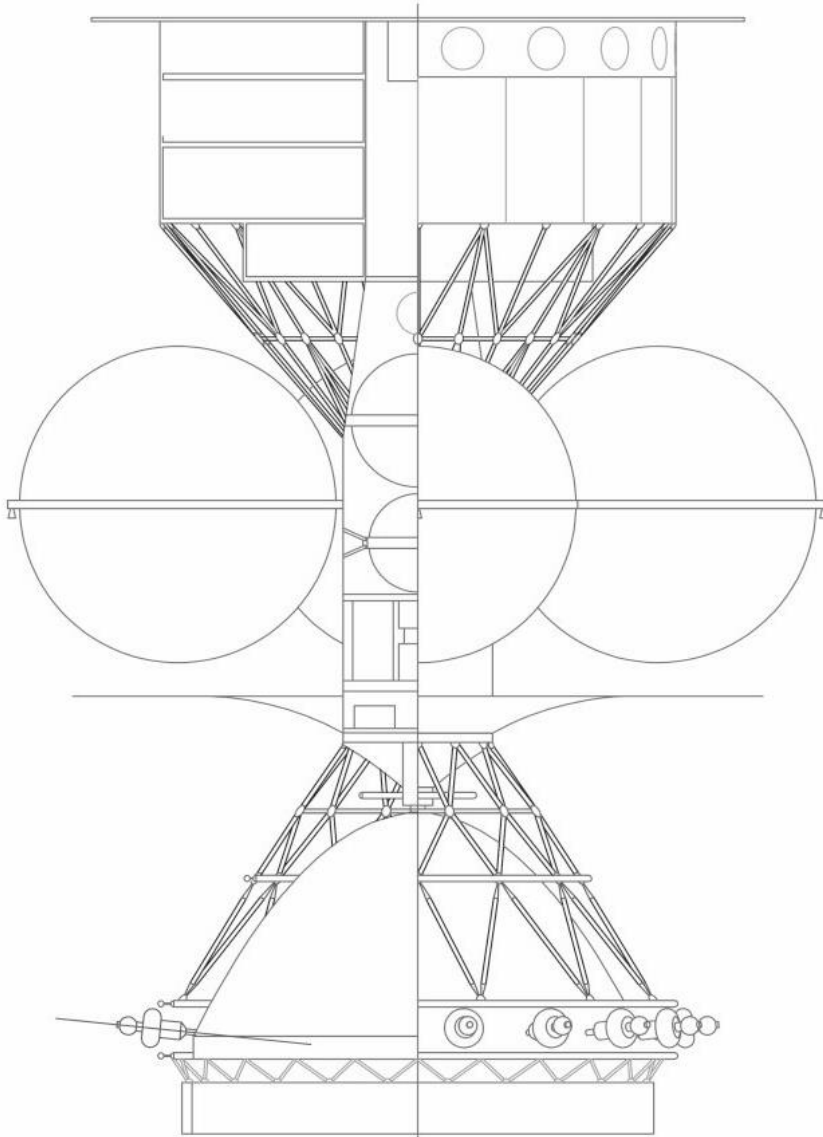
(7) Ultra-low-cost laser → Interstellar travel → Diaspora

These developments are not merely for exploration and development or to satisfy idle curiosity. These developments, like ICBMs, communications satellites, and the environmental movement, will affect all people everywhere very directly in the same way.

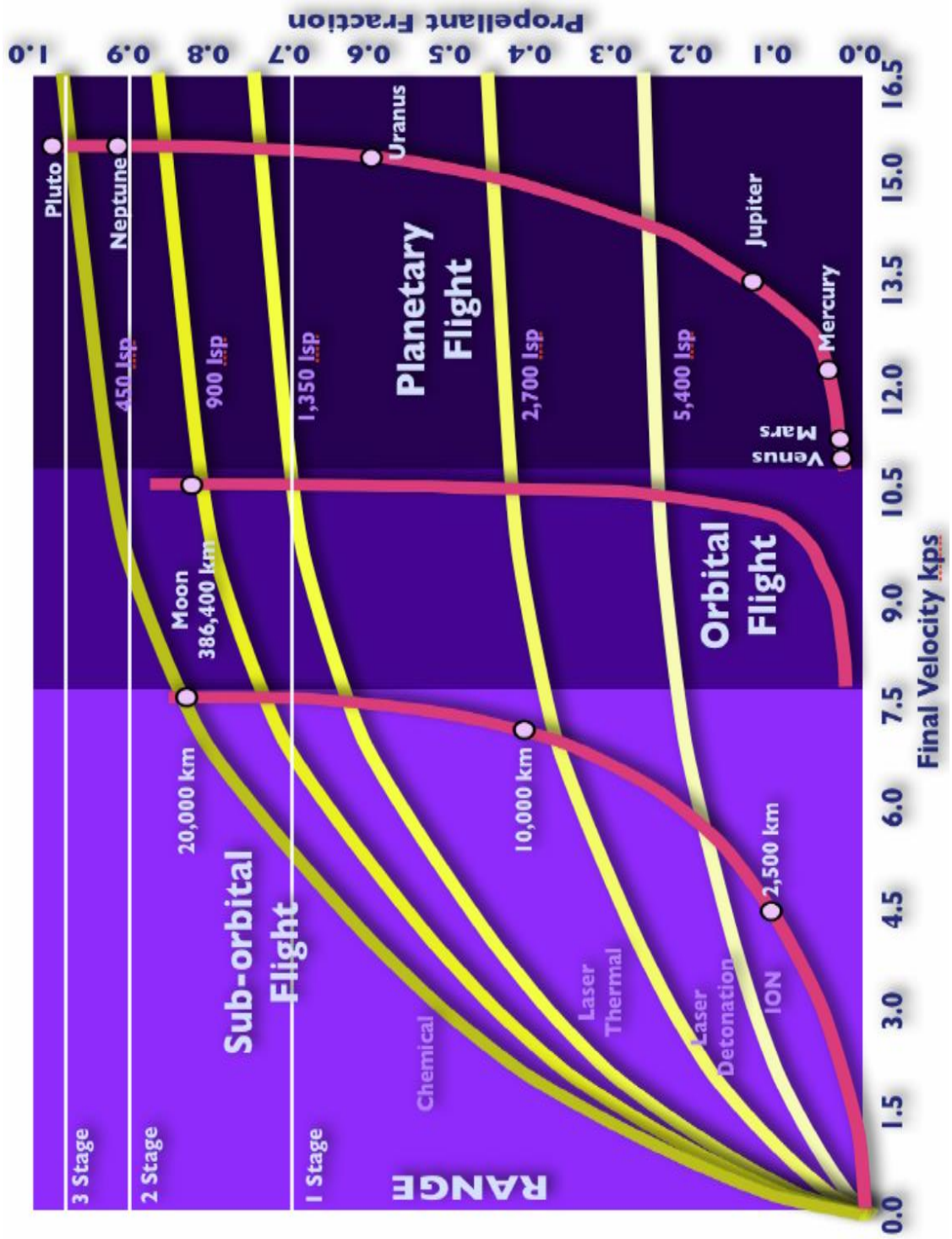
The heavens will open to humanity. While population rises, the numbers of people on any one planet will fall, leading to a condition in 100 years' time where people are exceedingly wealthy, powerful, and knowledgeable, but very rarely seen at any one spot. The Earth will return to a nature preserve and a resource of native life to charge our artificial biospheres. Our space homes will set sail across interplanetary space and then interstellar space. Beyond that, we will again be found in small, far-ranging tribes across the stars.

I have outlined this in more detail at www.youtube.com/watch?v=d0e2FJmXujA. I welcome informed feedback. I outline what we can do today to transform life on Earth using space technology before the year 2040.

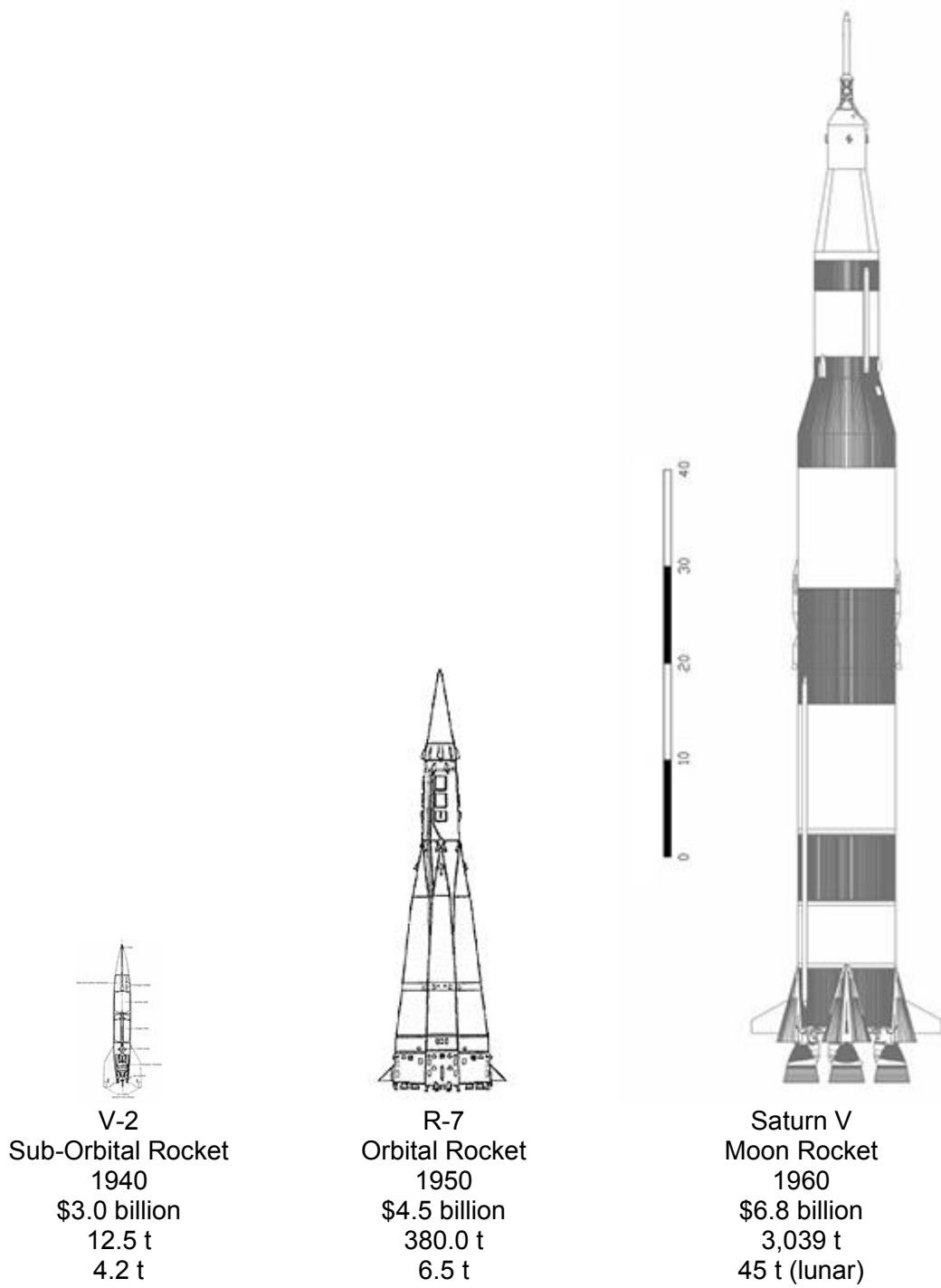
The Fourth Generation of Rockets Nuclear Pulse



Daedalus/Orion
Nuclear Pulse Rocket
1970
\$10.1 billion
10,000 t
6,000 t (interplanetary)



The First Three Generations of Rockets



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About William Mook, PE: Bill Mook has innovative science and technology ideas for more subjects than anyone you have met. Those subjects range from the rocket history he covers in this article to sustained industrial futures in Space. He approaches his subjects from a mix of engineering knowledge through financial analysis and imbeds them in philosophical rationale as a foundation to support his statement “*The heavens will open to humanity.*” He has had management and fiscal responsibility on Fortune 500 R&D teams and provided analytic work for the White House during both the Clinton and Bush Administrations. He holds patents for ground-breaking product developments. He is a member of the Board of Editors for *The Journal of Space Philosophy*.



Editors' Postscript: We encourage readers to find the published work of Bill Mook on the Internet. His analyses of Earth and Space energy and Space resources are solid evidence within *the Law of Space Abundance* that the Kepler Space Institute formulated in 2009. *Bob Krone and Gordon Arthur.*

Philosophy for Humans in Space

By Bob Krone, PhD

An input to the National Academy of Sciences Study on the Goals and Direction of the United States Human Spaceflight Program, July 4, 2013.

Abstract

The Law of Space Abundance reads “*Space offers abundant resources for human needs.*”¹ Philosophy is the oldest Science and Art. Philosophy is the pursuit of wisdom for decision-making.² Although I have defined philosophy for our Space Sciences purposes as “*The pursuit of wisdom for decision making,*” much of the work of philosophers through history had the goal of understanding, learning, and teaching about the physical and social world, not decision-making. For Space Sciences, we do not just study philosophy to see how historians described it or to do comparative studies of alternative philosophies. We study philosophy to design the foundations and principles to guide decision-making to create programs that will move humankind toward visions of the future. Once Space Philosophy that obtains the approval of decision-makers is created, it becomes the intellectual vehicle for moving successfully from theory to practice. In our case, the practices will be future journeys for Space exploration, development, and human settlement.

Introduction

The hypothesis of this white paper is that consensus on Space Philosophy will be the catapult for Space missions and operations proceeding to validate the long-held conviction of professionals within the global space community that human spaceflight is a necessity. It will achieve a continual improvement of the quality of human life on Earth and improve the chances of humankind’s eventual survival. If philosophy, science, and technology do not advance together, in harmony, the wisdom to create and apply the science and technology will be insufficient, conflicting, or even worse – catastrophic.

Philosophers Change Society

From Socrates, Plato, Aristotle (470-322 BC), and Confucius (551-479 BC) to Carl Sagan (1934-1996), thinkers have observed their social, political, and economic environments, found them wanting, and prescribed changes. Many were educators. Their ideas were adopted by others who helped document them for history and campaigned to produce changes consistent with the principles of the philosopher. Sometimes leadership adopted the philosophy and effected peaceful change. Too often the changes prescribed were threats to leadership, producing conflict, revolutions, and

¹ This law was created by the leadership of the Kepler Space Institute (KSI) in June of 2009. It reflects the conclusions of a century of scientific research on the Solar System and the Cosmos. It is not a law legislated by any government. It summarizes and defines the meta resources of Space awaiting capture for human needs both on Earth and as humans explore, develop, and settle in Space.

² Philosophy is defined differently in each science and by various authors. This is the definition the leadership of Kepler Space Institute created as relevant for its *Journal of Space Philosophy*, launched in the Fall of 2012. Go to www.keplerspaceuniversity.com and click on Journal.

wars. Philosophy dictionaries, encyclopedias, and websites document the thinking of philosophers in every century since 600 BC.

Philosophy is the study of knowledge, truth, existence, and reality. The word's origin is Greek, translated as *love of wisdom*. Philosophers search for the meaning, values, and purposes of life and the fundamentals on which they are validated. Values are principles and things preferred by individuals and groupings of individuals. Beliefs are what humans determine to be true and right for themselves and for others. Visions are the thought projections of people for their own futures and for the entities they create. Faith is the combination of beliefs and hopes considered valid for the future. In religions, faith is acceptance of doctrines and teachings. Humankind is the term embracing the human race, wherever found. *Civilization* for this essay is defined as human relations within a society, community, or Space settlement characterized by constructive civil behavior as opposed to destructive barbaric behavior.

Human Spaceflight Philosophy

There are critical differences between the Space Age and the rest of human history on Earth. No nation has ever had enemies in Space. The world's best international cooperative invention, the International Space Station, crosses our heavens every 90 minutes. There are three fundamental reasons why the Space Age began with Sputnik 1 on October 4, 1957 and has progressed for the past 56 years:

First, the urge for flight is part of our human nature. Perhaps it is in our genes, but from wherever it originates, it is undoubtedly our need to explore and our unquenchable curiosity about the universe that drives us to space. Carl Sagan said, "*We are star stuff.*"³

Second, even if these urges were ignored, the continual improvement of the quality of life for the human race on Earth, and perhaps even our ultimate survival, may hinge on the success of human exploration and habitation of space.

And third, we are all aware that this is a critical time for the space movement and for all of us. Human societies around the world are in turmoil and the prospects for our future have diminishing probabilities without the paradigm shift of benefits that Space holds for Earth's citizens and entities. Earth's resources are limited. Its current seven-billion population will reach ten billion by the mid-21st Century. Poverty is increasing – even in the United States. We see clearly that our generation can use the opportunity presented by our outward expansion into the solar system to design a rewarding and exciting future for human collaboration and to capitalize on the lessons learned from the venture into space to redirect human history on Earth toward peace and cooperation. United States Space leadership has been a fact throughout the 20th Century. The success of many variables of U.S. wealth, stability, and international prestige hinge on decisions made now for the 21st Century. U.S. success is now firmly linked to Earth's global health. Space holds the solutions for the future health of humankind.

³ Carl Sagan, *Cosmos* (New York: Random House, 1980). See also his *Cosmos* TV Series.

On April 21, 2008, Astrophysicist Stephen Hawking called for an era of Space conquest stating:

Spreading out into Space will have an even greater effect than Christopher Columbus' discovery of the New World. It will completely change the future of the human race and maybe determine whether we have any future at all.

Kepler Space Institute (KSI) Philosophy

With the initiation of *The Journal of Space Philosophy* in the Fall of 2012, KSI leadership reached consensus on a Space Philosophy to offer the Space Community.⁴ The short title for this Philosophy proposed by the Kepler Space Institute is:

REVERENCE FOR LIFE WITHIN ETHICAL CIVILIZATION

(1) Reverence for life is the foundational purpose that will sustain humankind in perpetuity; (2) ethical civilization will be the environment facilitating that end; (3) the Policy Sciences hold the solutions for creating ethical and successful civilizations. These are the three essential foundation blocks of KSI's *Philosophy for the Space Age*. Building these three basics will produce the highest probability of successful Space exploration, development, and human settlements plus the capture of Space resources for humankind's needs on Earth and in Space within the *Law of Space Abundance*. Failure to build any one of these building blocks will destine humankind to permitting similar or worse mistakes and catastrophes to the ones that have plagued Earth's societies throughout history. This is U.S. and global leadership's major challenge for the 21st Century.⁵

The essential characteristic of positive progress and survival for humankind will be the universal acceptance of ethical civilization as its vision. Ethics is the study of the moral principles that govern behavior. It defines civil and compassionate human interactions. The will to live and the affirmation of life account for humankind's expansion on Earth throughout history. That expansion has occurred on Earth in spite of catastrophic setbacks created by both nature and humans. In both philosophy and religion, *good* is characterized by actions reflecting reverence for life. *Evil* is characterized by destructive and barbaric actions that damage and/or kill people. Civilization advances best when members of a society experience harmonious material and spiritual progress for all aspects of their circumstances.

⁴ Readers can access and download my article, "Philosophy for Space: Learning from the Past – Visions for the Future," free by accessing www.keplerspaceuniversity.com, clicking on Journal, clicking on Fall 2012 Issue, then clicking on Article 8.

⁵ This formula for the Philosophy of The Space Age can be the launch pad for an infinite set of intellectual creations that define its execution in detail. For the purpose of this essay, I will focus on the philosophy of Albert Schweitzer (1875-1965) concerning reverence for life and the Policy Sciences of Yehezkel Dror (1928-present) concerning governance. Philosophy and Policy Sciences encompass huge literature sources available to Space Community scholars. The purpose of this essay is to stimulate interest and to launch research. This will be done with general concepts and basic design, not with detailed justification.

The evolution of prescriptions for the reverence of life and ethical civilization to be basic societal values has proceeded in spasmodic ways in different societies, with religious thinkers and exceptional leaders, beginning independently in Greece, the Middle East, China, and India between the 8th and 6th Centuries BC. It almost disappeared during the Dark Ages, 500 to 1500 AD. The Age of Discovery, 1400 to 1600 AD, and the European Renaissance, 14th to 17th Century, spawned thinkers, scholars, artists, and rulers who valued discovery and material or spiritual progress. Later recorded history documents random belief in reverence for life and ethical practices within society, but no worldviews on those subjects. The 19th and 20th Centuries barely survived the escalating destruction of war. Every human era has had a DNA composed of a mix of positive and negative, of good and evil, of health versus physical and mental sickness, of tyranny and leadership serving the people, of genocide and humanism. Detailed discussions of that history are outside the scope of this essay. The primary scholarly justification used herein was written in Equatorial Africa, from 1914-1917, by Dr. Albert Schweitzer. It was first published in 1923.⁶

Discovery, science, technology, and invention have been persistent drivers of progress for humankind throughout history. The motives and application of those discoveries and inventions reflect variations of good and evil. They represent a positive reversal from pessimism toward optimism in the 16th Century. Christianity made the important change from antiquity's view of morality being that which is profitable and pleasurable to the belief that to be ethical and moral requires action promoting the welfare of others.

Another evolution of human thought was that individual action could produce gains, while passive inaction stalled progress. Over time, that characteristic has grown to the point where discovery and invention occur not by decades or years, not by months or weeks, but now in the 21st century even within nanoseconds. Society is exponentially changing, making accurate predictions for the future less probable.

What has been too often missing in decision cultures is the inclusion of an ethical and moral foundation. Earth suffered through a 20th century of human catastrophes caused by other humans. The resources consumed could have been used to discover ways to prevent or ameliorate natural threats to humankind coming from our planet or from Space. Unfortunate choices were made that were void of *Reverence for Life within Ethical Civilization*.

A valuable lesson for 21st Century Space Age decision-makers is that failure to understand the benefits of this philosophy will stall or reverse humankind's progress. Albert Schweitzer ended his Chapter 11 of *Philosophy of Civilization* (1923) with the conclusion: "*Without ethical civilization our fate is sealed.*"

Kepler Space Institute (KSI) concluded that the Philosophy for the Space Age should be *Reverence for Life within Ethical Civilization* and launched *The Journal of Space Philosophy* in the Fall of 2012.

⁶ Albert Schweitzer, *The Philosophy of Civilization* (London: A. C. Black, 1923).

Recommendations. The Kepler Space Institute (KSI) recommends that the National Academy of Sciences (NAS) include the subject *Philosophy for Humans in Space* in its sponsored programs for NASA and for private U.S.-based Space organizations.

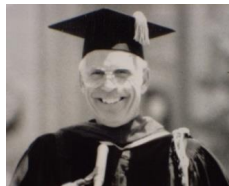
At the International Space Development Conference 2013, at San Diego, May 23-27, the Banquet Keynote Speaker was Dr. A. P. J. Abdul Kamal, Former President of the Republic of India.⁷ His address was titled “Space Solar Power: Key to a Livable Planet Earth.” Dr. Kamal is unique as a national Head of State with expertise in Space Sciences and Technology. He proposed to the Global Space Community *A World Space Vision 2050*.

A second recommendation of this paper is for the United States to take an aggressive cooperative leadership position to launch *A World Space Vision 2050*. Benefits to the United States and to humankind are not measurable now, but will prove to be immense.

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About the Author:

Bob Krone, PhD, is the Co-Founder and Provost of Kepler Space Institute and the Editor-in-Chief of the *Journal of Space Philosophy*.



⁷ Dr. Abdul Kalam’s full keynote speech can be accessed at www.nss.org/news/releases/Kalam_Address_ISDC2013.pdf

Space Research

By Bob Krone, PhD

Research to facilitate Space exploration, development, and human settlement is as important for Kepler Space Institute leadership as Space Education. The for-profit corporation, Kepler Space Institute, Inc. (KSI, Inc.), registered in the State of Florida of the United States (authentication ID = CC3821618653), will be involved in research while it plans for creating the Kepler Space University to deliver degree programs within the Space and Earth Sciences.

Readers will find Research articles in the two first issues of this Journal at www.keplerspaceuniversity.com. Click on a “Journal” Issue to get the Contents, then click on the “*Research*” article to open or download.

The Fall 2012 issue Research article contains hypotheses and research questions on twenty-nine subjects from Bacteria to X-Prizes. The authors for those were Space professionals who had been co-authors of chapters in *Beyond Earth: The Future of Humans in Space*.¹

The research article for the Spring 2013 issue was prepared by the Journal’s Research Editor, Dr. Kseniya Khovanova-Rubicondo. It contains hypotheses and research questions – submitted by five professionals – on humankind’s survival, philosophy, leadership, resource management, spiritual aspects of Space, and curiosity.

This third issue of the *Journal of Space Philosophy* covers “*Theory for Space Research*.” A review of the hypotheses and research questions documented in the previous issues of this Journal confirms the fact that there may be an infinite number of unknowns to solve as the movement of humans to living and working in Space evolves.

Research Theory

Knowledge is the understanding of information, of a science, of a paradigm, a theory, an art, or a tool. Knowledge is the goal of learning and learning is the purpose of research.

*Learning is the only thing the mind never exhausts,
never fears, and never regrets. It is one thing
that will never fail us.*

Leonardo da Vinci (1542-1519)

Wisdom is the ability to use the results of research in support of values, visions, goals, plans, and projects known to be good.

¹ Ed. Bob Krone (Toronto, ON: Apogee Space Press, 2006).

Space fiction and Space Research is filled with hypotheses.

Hypotheses provide expectations for the future. They have four possible outcomes:

- 1) Future events and research may validate them,
- 2) events may prove them to be invalid,
- 3) they may contain some mix of truth in the projection,
- or 4) insufficient evidence may be found to state any findings or conclusions.

A huge number of Space research questions have been answered. Evidence of that comes from the all the manned and robotic systems that have been successfully accomplished in the 20th Century and those exponentially increasing as the 21st Century gets underway.

But the unknowns of the universe and the current state of Space exploration, development, and human settlement are vast. Research has opened the Space Epoch. Research will be a major vehicle that drives all future achievements. What are the fundamental principles that will assure Space research will achieve the philosophy and goals we are documenting in this Journal?

Research has two quite distinct forms. The first form is the traditional academic one, where libraries and electronic data sources are searched for relevant information and for the experience and views of scholars and experts in the field. The second form involves extracting the know-how of those who actually do the work. This second form has been recognized increasingly as being essential. It is projected to increase in value as the rate of change in science, technology, and society continues to increase.

Fundamental Space Research Categories

There are three necessary and sufficient categories of research that apply to both the library and Internet search and the personal know-how search forms of research. They are:

- BEHAVIORAL RESEARCH, to discover what exists.
- VALUES RESEARCH, to reveal what is preferred.
- NORMATIVE RESEARCH, to prescribe what should be done.

Behavioral Research asks Who? What? When? Where? How many? How much? and What interactions? The behavioral research scientific statement is:

**“If certain facts are observed over time, then a known result will occur...
with probability (P).”**

This is the bread-and-butter category of any research. It discovers just what exists and what is happening within the system. It relies heavily on the inductive logic for which Sir Francis Bacon (1560-1626) is famous.

Values are things or principles preferred. Values Research identifies what beliefs, assumptions, and preferences underlie decisions and actions. It asks: Why? For what ends? With what priorities? With what commitment? for different players and stakeholders. The basic values research scientific statement is:

“The [system] [decision makers] [groups] [individuals] prefer(s)...”

Normative research identifies, confirms, and justifies what should be done. It uses all three logic forms: inductive (of Bacon), deductive (of Aristotle), and abductive (of Hegel and James Peirce). It specifies: “How to (improve/solve)...” It is the prescriptive side of research for Space solutions. It creates alternatives for decision makers. The normative research scientific statement is:

“If you want certain results, then follow prescriptions #1 through #n and you will succeed with probability (P).”

For your decision-maker to accept your recommendations, your prescriptions must be perceived as economically, technologically, and politically feasible now or in the foreseeable future. Space programs always have a longer future than Earth programs because for Space all the variables need analysis and resolution for it to go. Earth programs can often have a go followed by incremental decisions as knowledge accrues from implementation.

Behavioral research can focus on the past or the present. Values research can be done on the past, present, or the future. Normative research is aimed at the future.

Making decisions primarily on the basis of research in only one category has high risks but frequently happens. When one category of research is done poorly, the quality of findings should be carefully investigated. That does not mean that decisions based purely on experience and intuition, without additional research, are necessarily of poorer quality than those after lengthy research. The wisdom of experience is certainly better than bad systems analysis, but Space decision makers should have a caution flag flying if their policymaking system consistently ignores one or two categories.

Research Evolution from data to wisdom

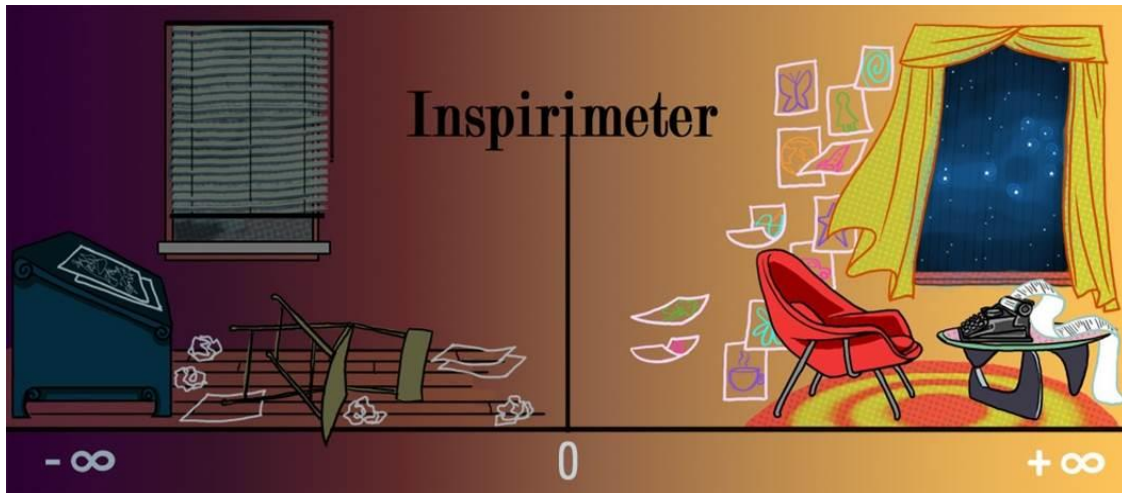
Data results from research, no matter how accomplished. Information emerges when meanings can be attributed to the data. Knowledge is the understanding of information, of a science, of a paradigm or theory, of an art, or of a tool. Wisdom is the ability to use data, information, and knowledge in support of values, goals, plans, and projects deemed good.²

² The above research theory discussion is an abstraction of “On Research.” Chapter 7, in Robert M. Krone, ed., *Essays for Systems Management: Leadership Guidelines* (Daniel Spencer Publishers, 1991).

From Research Theory to Space Benefits for Earth

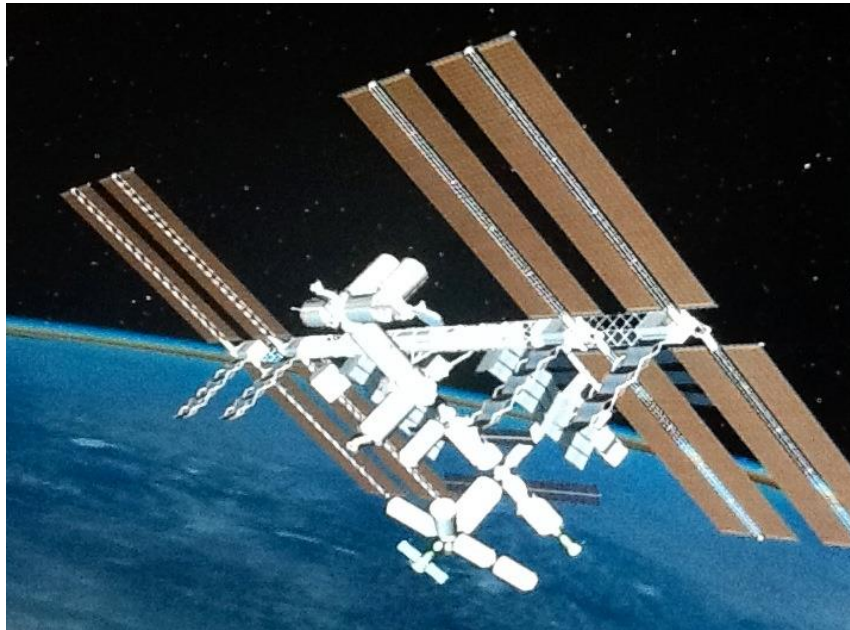
There has been an interesting evolution for the history of Space research. We chose Johannes Kepler for the name of our Institute because of his life-long research (1571-1630). His research gave us his Three Laws of Planetary Motion in 1605. Those laws permitted the calculations for Space missions to today.

Our first President of Kepler Space Institute, Dr. Richard Kirby, designed the *Inspirimeter* in the following image:



It portrays the requirement for innovative research for the future including research of the universe and its benefits for humankind.

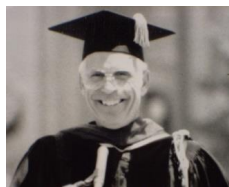
I refer readers to all the other articles in this issue which relate to Space research past, present, and future. This article is not the place to document the huge benefits Space research and missions have brought to humankind as of 2013. Our *Journal of Space Philosophy* is dedicated to that task. I will just end this article with an image of today's best example of international Space research, which brings benefits to people on Earth every day – the International Space Station:



Bob Krone, PhD, Fallbrook, California, USA, 1 October 2013.

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About the Author: Dr. Bob Krone is Co-Founder and Provost of Kepler Space Institute and Editor-in-Chief of *The Journal of Space Philosophy*. His 17-page Curriculum Vitae can be found at www.bobkrone.com/node/103.









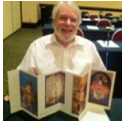








Journal of Space Philosophy (JSP) Board of Editors










Kepler Space Institute is honored to have 38 of the world's Space Community professionals as members of the Board of Editors for the Journal of Space Philosophy.








Dr. Elliott Maynard, our Journal of Space Philosophy Board of Editors colleague, has beautifully stated both the purpose and the style for our peer reviews:

"This is such a hi-caliber group of leading edge thinkers and supercharged individuals, it should be natural for each of us to wish to provide a supportive and synergistic environment for the others. I have also learned always to have someone else proof read any material I write, as I have discovered that the brain tends not to "see" my own simple mistakes. Ergo, within the new Kepler context I feel editors should be there to support our writers in the most creative and positive ways possible." Elliot Maynard, e-mail to Bob Krone, 23 March 2013.








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4.  **BEN-JACOB, Eshel, PhD**, Former President of Israel Physical Society; Founder Science of Bacterial Intelligence. Tel Aviv University.
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25.  **PEART, Kim**, Co-Founder, Virtual Orbiting Space Settlement (VOSS). Artist, Visionary, virtual worlds.
For Bio Info: www.independentaustralia.net/about/ia-contributors/kim-peart-bio/.
26.  **ROBINSON, George S., III, LLD**, Space Law Pioneer and International Space Expert. Smithsonian Institute Legal Counsel.
For Bio Info: See Issue 1.1 Article 14.
27.  **SCHORER, Lonnie Jones**, Kids to Space Author and Teacher. Architect, Aviator.
For Bio Info: See Issue 1.1, Article 17.
28.  **SCHRUNK, David, MD**, Aerospace Engineer, Founder, Quality Laws Institute, KSI Faculty.
For Bio Info: See Issue 1.1, Article 18.
29.  **SCHWAB, Martin, PhD**, International Space Author, KSI Faculty, Aerospace Technology Working Group.
For Bio Info: See Issue 1.1, Article 21.
30.  **SCOTT, Winston E.**, American Astronaut, Vice President for Development, Florida Institute of Technology.
For Bio Info: www.en.wikipedia.org/wiki/Winston_E.Scott.
31.  **STEPHANOU, Stephen E., PhD**, Emeritus Professor of Systems Technology, University of Southern California, Los Angeles, California, USA.
Bio: Dr. Stephanou was the Department Chairman for the Systems Technology Department for the University of Southern California's Systems Safety and Management Institute (ISSM), 1974 to 1993. He was one of the few leaders that built the Master of Systems Management Degree Program (the MSSM) to be the original and largest Systems Science graduate degree program in the world. By 1988 USC was teaching the MSSM at 82 Study Centers across the United States, in Asia and in Germany. At USC graduations in the 1980's 20% of all masters degrees awarded (1800 to 2000 a year) were for the MSSM. The Faculty for that program exceeded one-hundred divided into three Departments. Dr. Stephanou was a leading textbook author within that Faculty.

Bob Krone Postscript: Dr. Stephanou was influential in my being hired on the ISSM-USC Faculty in 1975. The Stephanous (Steve and Rita) and the Krones (Bob and Sue) became good friends in 1976 and have remained so to 2013. Steve supported my initial research with NASA during the Summer of 1980 which began my Space Community activities. It is an honor for Kepler Space Institute to add Dr. Stephanou to the Board of Editors for the Journal of Space Philosophy.

32.  **TANG, Terry, PhD**, KSI Director of Research.
For Bio Info: See Issue 1.1, Article 24.
34.  **THORBURN, Stephanie Lynne**, Author, Astrosociology.
For Bio Info: See Issue 1.1, Article 12.
34.  **WERBOS, Paul, PhD**, United States National Science Foundation, Space Scholar.
For Bio Info: See Issue 1.1, Article 19.
35.  **WHITE, Frank, MSc**, Founder, The Overview Effect Institute.
For Bio Info: See Issue 1.1, Article 9.
36.  **WILKINS, John, PhD**, Professor of Space Settlements.
37.  **WOLFE, Steven**, Space Advocate and Author of the 2013 Space novel, *The Obligation*.
For Bio Info: See Letters to the Editor in this issue.
38.  **ZUBRIN, Robert, PhD**, President, MARS Society.
For Bio Info: www.en.wikipedia.org/wiki/Robert_Zubrin.

“The greatest use of a life is to spend it for something positive that outlasts it.”

Dr. Max T. Krone, Dean, Institute of the Arts, University of Southern California and Founder, Idyllwild School of Music and the Arts, 1950

