

Human Space Activity: The Spiritual Imperative

By Madhu Thangavelu

Religion and scientific pursuits parted company centuries ago, at least in the eyes of the public, most notably in the West during the historical inquisition of Galileo, a devout Christian. He is reputed to have stood by his empirical evidence of the Copernican, sun-centered view of our solar system even under the threat of death by the preferred torture method of the day for heresy: burning at the stake. How dare a commoner employing lowly empirical objective logic challenge the supreme authority, especially on heavenly matters? The church, struggling with the dogma of the time, placed Galileo under house arrest for the rest of his life.

Religion and science have butted heads before and after Galileo, and they continue to seek common ground, but to the layman, the philosophies are irreconcilable. How can we expect a dogma that rests its case at every turn on divine intervention to come to terms with one that employs impeccable, cold, and sterile logic coupled with incremental data gathering to bolster evidence to arrive at its conclusions?

The refined sensitivity of the human mind to the cosmos and environment is clearly evident in the verses of the song called *Laudes Creaturarum* (Praise of the Creatures, also known as Canticle of the Sun), attributed to St. Francis of Assisi. The Sun and the Moon, the most prominent orbs that grace our skies, have a deep-rooted significance in every great religion as well as in science, which employs state-of-the-art technologies to explore and understand the workings of these celestial bodies in our neighborhood, and yet the philosophies could not be further apart. Perhaps that is how it is meant to be? Often, opposing philosophies are needed for the fertile mind to imagine and create new visions.

After all, religion was the primary purveyor of science, and especially astronomy, as is evident in the symbols and images projected in cathedrals and churches and temples all over the world. The heavens belonged to God and religion. Even today, the architecture of religious structures, altars, and prayer spaces around the world aspires to the heavens, and some elaborate geometries are summoned in their planning and design. It is interesting to note that the term "Big Bang," though coined by Fred Hoyle, referring to the birth of our universe, was conceived by a clergyman, Monsignor Georges Lemaître of Belgium.

People are born into religion and ritual and end their lives in the same way, even though many of us stray away from organized religion and liturgy for most of our lives. Never do we hear of a scientifically accurate christening of a new arrival or send-off for the soul of the departed. Religion and spirituality console and comfort the human soul in a way that science cannot.

Albert Einstein once responded to a question about his religious beliefs by saying that he was utterly in awe and wonderment as nature slowly gave up her secrets and that he

was a religious practitioner of science in that respect. Here we see a thought linking religion and spirituality. I think he was referring to spirituality, the essence of all religion, the belief in a supreme power of nature that seems to run the universe with some, yet-to-be-wholly-grasped, supralogical processes, with ultra-mathematical precision to which Vivekananda refers in his lecture on immortality delivered at the Chicago World's Fair in 1893. Even atheists find the power of nature utterly overwhelming.

Religion and spirituality are clearly different, but religion, stripped of all customs and liturgical practice, may reveal an underlying spirituality. It is the essence of wonderment that explorers feel when they are exposed to nature's secrets and subject to awe-inspiring new dimensions in human experience. The great director Peter Brook once said that the human-made world around us is conspiring at every moment to rob us of the sense of awe and wonder that the universe and nature continually presents to us.

Now, this unfathomable power seems to run into trouble with conventional scientific thought all the time; just ask Stephen Hawking or Richard Dawkins. Of course, it is taboo to bring up issues relating to religion or spirituality in modern scientific discussion, though many scientists are privately very spiritual in their beliefs. It is worthwhile to note that doctors practicing modern medicine use spirituality and prayer in the healing process and hospitals have religious or nondenominational spaces just for patients.

A definition that encompasses both of these great philosophies is that proposed by Tolstoy in his essay "Confessions," in which he presents the idea that the greatest science of all is the science of the universe and humanity's place in it. He paints the range of human thought as anchored at one end by theology and at the other by pure mathematics; no reconciliation this, but at least it puts philosophies along a continuum of human thought without artificial walls. John Templeton sought to bring discussion of science and religion closer, and the Templeton Foundation offers annual prizes to those attempting to weave the philosophies together.

Seeking new models for rapidly evolving governance of societies, moving from nationalism to internationalism and beyond, grappling with global issues and the economics of globalization, we seem to be at the threshold of a newly refined era.

Due to globalism, a wholesome new view of our planet and all its contents, the integration of the stewardship of planet Earth and nature in the wake of the effects of climate change, we are coming full circle to embrace the mystical philosophy of transcendentalism, articulated nearly two centuries ago by Thoreau and Emerson, among others. This holistic notion of our planet is being advanced and enhanced by human space activity.¹

Teilhard de Chardin, a priest, presents the case for the evolution of global consciousness and the arrival of the Omega Point for humanity, and Vladimir Vernadsky talks about the noosphere or the emergence of the global mind, a new layer added to our

¹ The Overview Effect is perhaps a part of this.

planet on top of the geosphere and the biosphere. We live in the Anthropocene epoch, and stewardship of Eden has now become the sole responsibility of our species. The Global Consciousness Project run by Princeton University and projects at the Institute of Noetic Sciences are currently engaged in extending noosphere philosophy. Rapid advances in information technology are changing the scope of our situational awareness, and a global brain with newly evolved and refined sensitivities towards humanity and life, ecology, and the environment is emerging. Vernor Vinge and more recently Ray Kurzweil have talked about the acceleration of technology toward a point referred to as a singularity, projecting visions of merging humanity and technology, blurred, fused, and indistinguishable as separate; human evolution on an accelerated path?

Current trends in machine learning and artificial intelligence (AI) allow us to collect and parse huge amounts of data generated by a horde of systems and sensors that is impossible to distill, let alone act upon, using our innate skills. Tools like DALL-E and MidJourney are already revolutionizing the way creative professionals like artists and architects imagine and create new products and buildings. Scientists use these tools to create and study alternative models for research. Doctors and surgeons are starting to depend on AI and robots to conduct lifesaving procedures. And yet we take leaps of faith to arrive at desired outcomes, failing often and succeeding sometimes. Louis Pasteur, when confronted about this scientific quandary, was quick to point out that "chance favors the prepared mind." Is it just chance, or does something deeper and innate drive us forward? Faith? Spirit? Nature?

NASA spends a lot of time and resources focusing on the technology that sustains human space explorers engaged in scientific exploration: a term used to say that these highly specialized professionals are engaged in the pursuit of scientific discovery. It is a very narrow view of human space activity. Space commerce is brimming with ideas beyond the mature and revenue-generating satellite communications field that are awaiting exploitation, among them, beaming solar energy from space and providing extensive refueling operations for outbound vehicles. It is well known among engineers that erecting and deploying large structures such as the ISS or endurance-class spacecraft and space-based solar array farms require on-site human supervision. These crews will find spiritual solace after a hard day's work, looking out at the Earth's disc, from their private quarters in orbit.

As the government astronaut corps around the world continues to shrink, a growing number of human space explorers are wealthy individuals without the professional background or rigorous training of government astronauts. They are seeking to experience spaceflight, to feel outer space in their bellies and souls, and to witness the fragile planet directly while floating above it. The driver seems to be spirituality; physically seeking, experiencing, and appreciating humanity's place in the universe. We call them space tourists. Space adventurers or spiritual tourists, a better term, perhaps?

Space companies like SpaceX, Blue Origin, and Virgin Galactic now have a backlog of people ready to experience space as private citizens. The remark by William Shatner, the indomitable Captain Kirk of the USS Enterprise crew in the long-running TV show *Star Trek* is worth noting. After his short suborbital flight on the Blue Origin New Shepard rocket, looking through those large windows on the capsule, he could see that the blue planet below was all about life, while the still pitch blackness of space, just a few miles above our skies, reminded him of death. Life and death are subjects that are at the heart of the human condition, and the emotions evoked by related events are much better dealt with in the spiritual sphere of our lives. When asked on the Colbert Show about what happens after death, Keanu Reeves said that “the ones who love us will miss us.” How do we translate that into scientific terms? Answer: don’t even try!

Are there areas of science and technology that weave into religion and spirituality? It appears that human space activity offers a venue to explore possibilities. While robotic spacecraft roam the solar system, sending us intriguing images from worlds afar, the yearning of humanity to be physically present there is what drives NASA and others to pursue space exploration. Without a vibrant human space activity component, NASA may not have a reason to exist.

As the crew lifts off into orbit, though their eyes are on the cockpit monitors and their ears tuned to mission control jargon above the roar of those mighty engines, they are praying for a successful and smooth launch. That is because, despite checks and cross checks and counter checks, despite the best efforts of ground crew and controllers, many things can still go wrong in such a complex system. The monitoring of the final minutes before launch is so rigorous and intense that the entire sequence is handed off from the crew to a set of computers. When your life is in the hands of machines, prayer is important.

Upon arrival at the ISS, the first thing on their minds is to look out at planet Earth. The ISS now sports the Italian-made cupola, a large and exquisite window that looks toward planet Earth, and it is perhaps the most aesthetic component of the entire facility. Of course, it is no secret that the ISS crew spends a lot of its free time just looking out this cupola and marveling at the dynamic colors and drama the Earth gliding below them offers, even as the day becomes night and back again, all in a matter of minutes, as they orbit the planet. As they gaze at Earth through this large cupola, the crew is immersed in a spiritual experience.

I have had astronauts stare me back in the eye when posed the question, how does it feel to be walking on the surface of the Moon? Well, you really have to be there to experience it, they say. Words will not do. It appears their sensory systems are turned up to the highest alertness levels, heartbeats racing like athletes during peak performance, and they are soaking in terabits of information. This rush of data is simply too hard to debrief, in technical terms, prose, or poetry. When faced with such a high, though they are fully aware that it is Newton and Kepler’s Laws that guided them there, their minds

and souls quickly gravitate toward the scriptures. And human space explorers seek that intense spiritual experience and are willing to risk their lives for it.

Most crews of space missions come back changed forever. This phenomenon is addressed in several books, notably in *The Overview Effect* by Frank White. Astronauts do not see national boundaries, they do not see warring nations, but they do notice the ravages of humanity and industry on the face of the planet.

What they primarily see is a stunningly vibrant planet, lots of blue, aquamarine ocean, virgin white snow-tops on mountain ranges, and scattered puffs of cloud cover, dynamic with flashes of electric blue lightning, as the continents whizz by below them in absolute silence, no one asking them for country of origin or standing in line for visa verification. They see the whole world as one giant harmonious living entity and globalism, that feeling of oneness with nature, takes root in their hearts and souls. A common humanity becomes reality from orbit and cosmopolitanism, the philosophy of acceptance and inclusion of all peoples, the richness and strength of plurality of diverse old cultures and the heritage of customs and shared values become obvious. *E Pluribus Unum* rings loud and clear from orbit.

In worldly affairs and governance, in daily life and commerce, culture and religion, ritual and spirituality all trump science and technology every time. Science and technology are but tools, sophisticated tools of our time, merely used to fulfill human urges and nourishment for our intellect. When faced with the raw wonder and awe of nature, humans always gravitate toward spirituality. That is why when Apollo 8 slipped into lunar orbit, the crew recited from Genesis and why Buzz Aldrin took communion before he stepped onto the Moon.

Yes, perhaps human spaceflight and associated experiences like simulations, aided by advanced gaming systems that use AI and machine learning coupled with augmented and mixed reality, can bring science and spirituality closer together as many more people from various nations, cultures, and walks of life are able to experience space, either directly or vicariously, the sheer awe and wonder of our cosmos and nature. Could this be the *raison d'être* for the very physical presence on this plane we call Earthly existence. Is technology driving us toward a new dawning of cosmic situational awareness? I suspect, since modern science is reticent on this topic and related matters, the answers to such questions lie deep in the disciplines of spirituality and space philosophy.

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About the Author: Madhu Thangavelu conducts the ASTE 527 Graduate Space Exploration Architectures Concept Synthesis Studio in the Department of Astronautical Engineering within the Viterbi School of Engineering at the University of Southern California. He also teaches the Arch599 Extreme Environment Habitation Design Seminar in the School of Architecture, where he is a graduate thesis adviser. Mr. Thangavelu's educational background is in Architecture (Master's in Building Science, USC School of Architecture 1989) and in Engineering (Bachelor's in Science and Engineering, National Institute of Technology, Calicut, India, 1980). He is also a graduate of the inaugural summer session of the International Space University held at MIT in 1988. Versions of Madhu's master's thesis (conceived during ISU '88 at MIT) entitled "MALEO: Modular Assembly in Low Earth Orbit. An Alternate Strategy for Lunar Base Establishment" were published in several journals worldwide. At USC, he was mentored by and worked as a research assistant and research associate under Prof. Eberhardt Rechtin, Professor of Electrical, Systems and Aerospace Engineering (while he was creating the Systems Architecting Engineering program at USC), considered the chief architect of NASA's Deep Space Network and President Emeritus of Aerospace Corp.

He is a co-author of the book *The Moon: Resources, Future Development and Colonization* (John Wiley & Sons 1999), and the second Springer/Praxis edition was published in 2007, third edition in preparation. He is a former Vice Chairman for Education, Los Angeles Section of the American Institute of Aeronautics and Astronautics (AIAA). He has directed Space Exploration Projects at the California Institute of Earth Art and Architecture. Mr. Thangavelu is also the invited author of the chapter "Living on the Moon" in the *Encyclopedia of Aerospace Engineering*, a major reference work published by John Wiley and Sons in October 2010, updated in 2012.

He was on the team that won the coveted NASA NIAC Phase 1 and 2 awards consecutively for developing robotic building technologies on the Moon and Mars with PI Prof. Behrokh Khoshnevis. Mr. Thangavelu's concept creation work was greatly appreciated for proposing ideas that pointed to the "leading-edge sensor concept" for return to flight of the space shuttle fleet. Mr. Thangavelu is on the faculty of the International Space University, an international organization that offers advanced interdisciplinary, intercultural, and international training for promising leaders and space professionals. He is the North American coordinator for the International Moon Village

Association and is a Director of the National Space Society (NSS). He is the NSS Vice President and Liaison for NSS India.

Editors' Notes: Dr. Madhu Thangavelu has also been writing about space philosophy since the 1980s, making his perspective another valuable addition to our retrospective on the past decade. He has also appeared in the JSP five times since 2014, and we are grateful for his contribution to this anniversary issue. In this article, he once again explores the spiritual side of humanity's relationship with space, with updates including artificial intelligence, machine learning, and the progress of the commercial space industry. He too strikes themes of unity and hope, advocating for a closer connection between science and spirituality. ***Mark Wagner and Gordon Arthur.***