



religions

The Mutual Influence of Religion and Science in the Human Understanding and Exploration of Outer Space

Edited by

Deana L. Weibel and Glen E. Swanson

Printed Edition of the Special Issue Published in *Religions*

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Paul Levinson

The Missing Orientation

Reprinted from: *Religions* **2021**, *12*, 16, doi:10.3390/rel12010016 **147**

About the Editors

Deana L. Weibel is an anthropologist of religion. In 1995, she undertook her first field study in the French shrine towns of Lourdes and Rocamadour. Decades of investigating religious pilgrimage passed, but her childhood fascination with space (and the humans who study and travel into space) persisted. By 2015, her interest in the place of religion in space exploration moved to the forefront of her research, and she began interviewing astronauts, astronomers, engineers, and others with links to NASA and planetary sciences. Her ethnographic research into space exploration suggests that religion is a fundamental part of human culture and will remain with humans, transforming and adapting if and when we establish settlements beyond our own planet.

Glen E. Swanson of the Center for Scholastic Programming in Aerospace Education was that kid who was always thinking about rocketing to other planets. He loved NASA and had a childhood full of moon landings, *Star Trek*, and *Star Wars*. In 1991, he founded *Quest: The History of Spaceflight Quarterly*, which eventually propelled him into a job as Chief Historian at NASA's Johnson Space Center, then work on running his own space book and memorabilia business. He has taught physics labs, was a counselor at Space Camp, coordinated programs at the Michigan Space and Science Center, and co-founded and co-organized the Roger That! event in Grand Rapids, but now spends most of his time researching and writing about the history of human spaceflight.

Preface to “The Mutual Influence of Religion and Science in the Human Understanding and Exploration of Outer Space”

Ever since human beings first began to stand upright (and possibly even earlier), they have exhibited a strong curiosity about the sky, particularly the night sky, with its spread of Milky Way stars, ever-changing moon, wandering planets, predictable constellations, and surprise appearances by comets and meteorites. Because the sky was unreachable, outer space was often synonymous with mysterious supernatural entities thought to influence human life, whether gods, spirits, or ancestors.

By the twentieth century, not only did humans understand more about the sky and space, but they had reached the once-impossible goal of going beyond Earth’s atmosphere and actually beginning to venture, slowly and hesitantly, into space itself. Space lost some of its mystery and became a sphere better explained by science. Religious belief did not disappear, however, and new human understandings of and experiences in outer space had an impact on religious practice. In the United States, the longing for a lost time of westward movement and trail-blazing may have stoked an interest in space as a “new frontier” or “new Jerusalem”, with the “race for the moon” against the Soviet Union further encouraging Americans to think about space in religious terms while also perhaps appearing to contribute to the secularization of a nation. The experience of venturing into space may have led to epiphanies among astronauts or have parallels with pilgrimage. Russian cosmonauts, in recent years, have placed icons of Russian Orthodox saints on the walls of the International Space Station. Even the dedication of thousands of space workers and supporters of space exploration can be understood in religious terms. Finally, a few have made an attempt to predict the characteristics of religious life in human settlements beyond Earth.

At the same time, supernatural and religious understandings of space among lay people remain strong. Astrology influences many, and various societies interpret space through a religious lens, with certain religious groups being more likely than others to see a future in space, and science fiction movies and television frequently consider what religion in space settlements might look like some day. The exploration of the relationship between ideas about religion and ideas about space can focus, then, on humans currently living in space, but also on humans on Earth.

While solid preliminary research has been carried out on the relationship between scientific and religious notions about outer space, this topic is fairly new, relatively understudied, and important to investigate. Religious and scientific thought are two major arenas where humans speculate and seek answers, and both are often aimed at understanding the place of Earth, and human society, in the greater cosmos. We know little about how these two realms of conjecture interact to inform each other, but the point where they overlap in our ideas about the unearthly, the celestial, and the ethereal is a good place to concentrate our efforts.

The articles in this Special Issue of Religions contribute to this endeavor by examining how religious and scientific notions held about outer space work together in human societies, religious communities, and in the minds of individual human beings. be answered in this Special Issue that focuses on one of the most studied and relevant food-associated mycotoxins.

Deana L. Weibel, Glen E. Swanson

Editors

Editorial

Introduction to Special Issue: The Mutual Influence of Religion and Science in the Human Understanding and Exploration of Outer Space

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When considering the exploration of outer space people typically think about technology, engineering, physics, and the use of the scientific method to understand what is out there, beyond the Earth's atmosphere, from the nearby Moon to distant galaxies only visible through the use of high-powered telescopes. Religion rarely comes to mind in this context, despite the fact that before humans practiced science as we do now, religion offered the only explanations humans had about where we were, why we were here, what the future might hold, and what those glowing, moving lights in the sky might be. Religion said the sun was Apollo's chariot, that Mars was the god of anger or war, or that the stars and planets moved in celestial spheres. Since then we have learned more about the universe around us, but scientific advances have not completely eclipsed religious perspectives. With this collection we seek to explore the various ways that scientific thought and religious understandings intersect, combine, contrast, and overlap in the exploration of outer space.

The mutual influence of science and religion in the way human beings understand and explore space is not well understood. In the United States, religion and science have recently been presented in the media as political enemies, even diametrically opposed, creating in many a misguided view that to accept science is to reject religion and vice versa. Our goal in this project is to shed light on the real connections that exist between religious and scientific thinking about outer space by bringing together a collection of multidisciplinary papers to add to existing scholarship and serve as a foundation for future research.

These papers feature different perspectives from a variety of academic disciplines, written by experts in anthropology, history, physics, communication studies, archaeology, art history, political science, disability studies, and philosophy. The first two articles provide some historical background demonstrating that the relationship between religion and science in the exploration of space is nothing new. Vatican Observatory Director and astronomer Brother Guy Consolmagno starts the collection with "Space and the Papacy", a discussion of how specific popes, beginning with Pope Leo XIII, who set up the first Vatican observatory in 1891, have promoted space exploration as a way to better understand the "heavens". Historian Glen E. Swanson continues the historical theme in his "The New Frontier: Religion in America's National Space Rhetoric of the Cold War Era" with an analysis of religious language used in the early days of the American space program, particularly the religiously charged concept of manifest destiny as applied to human exploration and settlement in outer space.

We next turn to contemporary religious communities in the United States, examining how religious understandings influence the way they conceptualize outer space and its exploration. Political scientist Joshua Ambrosius examines data correlating support for space exploration and religious affiliation in "Reexamining the 'Separation of Church and

Space': Evangelical Protestant Support for Space Exploration in the Trump-Pence Age", and specifically whether having Mike Pence, an evangelical Vice President who was also a space enthusiast, may have influenced support among evangelicals for NASA's programs and the projects of private space companies. Conservative Protestants are also the subject of anthropologist James Bielo's chapter, "Incorporating Space: Protestant Fundamentalism and Astronomical Authorization". Bielo notes that fundamentalist opposition to certain scientific subjects like evolution is well known, but that astronomy has recently become a more popular topic in "creationist cultural production". "Future-Day Saints: Abrahamic Astronomy, Anthropological Futures, and Speculative Religion", by Jon Bialecki, turns an anthropological lens on speculative fiction produced by and for authors associated with the Church of Jesus Christ of Latter-Day Saints, looking at both contemporary Mormon writings and those produced in the 19th and 20th centuries.

The next section of our collection takes us off the planet and into space, introducing a topic where scant research has been done—the actual religious practices and religious experiences that have taken place in space. We start with an example of "space archaeology". The term archaeology has been used for decades to refer to the study of objects made or modified by humans that reveal information about the cultures that produced them. Although archaeology is sometimes associated with antiquity, archaeologists frequently look at the artifacts and debris of contemporary societies, and that is what archaeologist Justin Walsh, art historian Wendy Salmond, and archaeologist Alice Gorman do here in their paper "Eternity in Low-Earth Orbit: Icons on the International Space Station". They focus on Russian Orthodox religious icons brought into space by cosmonauts living on the International Space Station and compare the religious use of these icons on Earth to the role they play in the ISS Russian Zvezda module. Deana Weibel keeps us in space with an anthropological discussion of Frank White's well-known term "the Overview Effect", which describes strong emotional and often spiritual experiences astronauts have when looking at our planet from space. In her article "The Overview Effect and the Ultraview Effect: How Extreme Experiences in/of Outer Space Influence Religious Beliefs in Astronauts", Weibel suggests that there is evidence for something she calls the "Ultraview Effect", a similarly strong response to seeing the enormity of space from space itself under certain conditions where an astronaut's view is unimpeded by the Earth's atmosphere or by the light of celestial bodies. She discusses the experiences of nine astronauts in terms of their exposure to both "effects" and considers the long-term implications of these experiences.

The final four articles suggest topics where the intersection of religious and scientific ideas about outer space offer a particularly fertile ground for future exploration. In "Models of Disability as Models of First Contact", Sheri Wells-Jensen and Alyssa Zuber take ideas from disability studies to consider whether future contact between humans and technologically advanced extraterrestrials would mirror the contact between disabled and abled people on Earth. Using examples of disabled-abled interactions on our planet, such as those based on religious understandings that see disability as punishment in some circumstances or a blessing in others, they examine just what it would mean for humans to interact with other, more developed species. Philosopher Kelly C. Smith takes a different approach in his "Cosmogeneration, Complexity, and Neo-Natural Faith in the Context of Astrobiology", one that questions whether religious activities or beliefs should hold any place in space exploration at all and considers what forms of religion might ultimately be compatible with human scientific pursuits in outer space. In "Religion, Science, and Space Exploration from a Non-Western Perspective", anthropologist John W. Traphagan also explores the potential congruity between scientific and religious ideas about outer space, arguing that practice-based religions like Buddhism may be better suited to space exploration than faith-based religions like Christianity. Finally communications studies scholar Paul Levinson concludes our collection of articles with "The Missing Orientation", which he defines as a sense of awe often associated with religion that might be exactly what humanity needs to inspire and guide human space exploration in the future.

The 11 articles included in this collection are presented as a starting point and an example of the potential a wide array of academic disciplines can bring to space exploration research. While countless studies have emphasized the engineering of spacecraft, the dynamics of pulsars, or the effects of microgravity on biology, research that focuses on the human experience in, and ideas about, the universe also holds value and may, in fact, turn out to be essential as human societies move beyond our home planet.

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Article

Space and the Papacy

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Abstract: There has always been a powerful connection in human consciousness between the beauty and otherworldliness of the night sky, and humanity’s religious yearnings toward a reality beyond the mundane. When Pope Leo XIII established an astronomical observatory in 1891, it was as a way of demonstrating the Church’s support of science; his choice of astronomy in particular was based primarily on the Holy See’s already established good reputation in the field, and specific opportunities for international collaborations. Nonetheless, since its founding, Popes have taken advantage of the natural connection between sky and “heaven” to promote the exploration of space as a way of coming closer, emotionally and intellectually, to the Creator. However, the nature of how this connection is understood has changed significantly over the past 125 years, most recently with the challenges of the Space Age.

Keywords: astronomy; history; Holy See; religion; Vatican

1. Introduction

A powerful connection has always existed between the beauty of the night sky, which gives visible evidence of an existence different from the world where we live, and humanity’s religious yearnings toward a reality beyond the mundane. This can be seen even in the observation that for many languages similar words are used to denote both “sky” (or “heavens” in English) and “heaven.” Italian and French, for example, use the same word for both.

One result was that, to the pre-scientific world, celestial activities such as the motions of the stars and planets were regarded as a parallel to the action of supernatural beings. A common feature of most ancient cosmologies was the belief that the physical universe mirrored the spiritual realm, and they often posited a “chain of creation” where different levels or aspects of the physical universe mirrored different levels within heaven. Thus, when the motions of the planets (which included the Sun and Moon) were each attributed to an individual dome over the disk of the Earth or, later, to separate crystalline spheres encasing the sphere of the Earth, each was also assigned to a different mineral or element, to its own god, or to the various ranks of angels; and their individual motions were connected by astrology to events on Earth (Crowe 1990; Danielson 2001; Lewis 1964).

The wordplay of “heaven” and “heavens”—which are the same word in Italian—was the root of the famous pun attributed to Cardinal Caesar Baronius by Galileo in his famous *Letter to The Grand Duchess Christina*: scripture was written to tell us “how to go to Heaven, not how the Heavens go.” However, in fact, the implied connection between matters in the sky and theological ideas continued even after the scientific revolution.

For example, Kepler argued for the heliocentric system on the basis of its parallels to the Holy Trinity. As he explained in a letter to his friend Herwart von Hohenburg, among the reasons for adopting his theory for the orbits of the planets in ellipses about the Sun was the mystical significance he read into the structure of the celestial sphere: “The center is the origin and beginning of the sphere. Indeed, the origin has precedence everywhere and is by nature always the first. When we apply this consideration to the most Holy Trinity, the center refers to the image of God the Father. Hence the center of this material world-sphere should be adorned by the most ornate body, that is the Sun ...

” (Kozhamthadam 1994). Kepler knew that the original Copernican system still required epicycles, and circular orbits that were not centered exactly on the Sun. Indeed, in that system the Sun still had its own eccentric motion about the presumed center of the system. It would hardly be fitting, reasoned Kepler, for God the Father to make this eccentric little dance around the center of the universe. God the Father had to be the center, in a literal sense. So, Kepler went searching for a better astronomical system; eventually he discovered that elliptical orbits allowed the Sun, and therefore by his model God the Father, to remain fixed at one focus of each planet’s ellipse.

By 1891, when Pope Leo XIII established the Specola Vaticana (Vatican Observatory) as a Papal observatory, such metaphysics had long since been abandoned. However, the Italian confluence of the meanings of *cielo* certainly remained; and along with it, a connection in the popular mind between the two.

Rather than a survey of popular attitudes at that time, however—a topic no doubt fascinating but beyond the scope of this work—the focus to be addressed here is much more limited: not to the general culture, but to the Popes themselves. Since the establishment of their Papal observatory in 1891, how have the Popes understood and used the symbolic role of astronomy? In what way did they expect that scientific research in astronomy could support their role as the leader of a major world religion? A close reading of the statements and documents on this subject by the popes who have maintained the observatory, from Leo XIII to Francis, shows a fascinating development in how they have embraced science and in particular astronomy, and the place they have assigned it within their role as a religious leader. In particular, we will focus on the comments of five popes who significantly advanced this development: Leo XIII, Pius XI, Pius XII, John Paul II, and Francis.

2. Leo XIII: Astronomy for Apologetics

Even before 1891, the year when Pope Leo XIII established a scientific institution at the Vatican as a way of demonstrating the Church’s support of science, there were a number of historical precedents of the Holy See support for the natural sciences, and, more often than not, astronomical sciences.

For one example, following the instructions of the Council of Trent, in the 16th century, the Holy See established a papal commission to reform the calendar. Its work included investigating a more accurate way of calculating the length of the year and establishing the dates of the first springtime full Moon, which signaled the date of Easter. Ironically, rather than attempting a formula based on such precise calculations, in the end the commission chose a simpler but more easily understood formula for determining the dates of movable religious feasts (like Easter) that are tied to the original lunisolar Hebrew calendar. Nonetheless, the role of Fr. Christopher Clavius SJ (1538–1612) in this commission led to his own research into astronomy at the Roman College, including his support for Galileo both before and after the latter’s demonstration of the astronomical telescope. Astronomical work at the Papal-supported Roman College and at other Jesuit institutions continued up until the suppression of the Jesuit order in 1773, including such notable Jesuit astronomer-priests as Christoph Scheiner (1573–1650), Niccolò Zucchi (1586–1640), Giovanni Battista Riccioli (1598–1671), Roger Boscovich (1711–1787), and Maximilian Hell (1720–1792).

In addition to the Roman College astronomers, scientific equipment was based at the Vatican itself at several points in its history. These included the meridian line commissioned in 1576, built within the Tower of the Winds above the Vatican Library; a seismological observatory set up following the earthquake of 1703; and a “Specula Vaticana” (note that it includes the Latin word for observatory, *Specula*, which is carried into Italian as *Specola*) including an additional meridian line and telescopes set up in the Tower of the Winds by the Vatican Librarian, Cardinal Francesco Saverio de Zelada (1717–1801), in the late 1700s; notably, a Dollond telescope installed in 1797. Although much of the observational work was soon moved across Rome to the Roman College (Gregorian University), astronomical calculations continued to be made within the Tower of the Winds. This resulted in two Vatican-supported observatories working in parallel well into the 19th century. Following the

revolutionary upheavals of Rome in 1848, these observatories were combined into the Roman College observatory of Fr. Angelo Secchi SJ (1818–1878) (Maffeo 2001).

Undoubtedly, Secchi's international reputation gave astronomy a special status at the Vatican. Secchi—a pioneer in spectroscopy, solar physics, meteorology, and numerous other fields—had won the Grand Prix at the 1867 Universal Exposition in Paris, and Napoleon III had awarded him the French Legion of Honor. At an international meeting in Paris to revise the metric system in 1873, delegates from Italy (whose capital had finally moved to Rome in 1870) objected to Secchi's presence representing the Holy See, which they did not recognize as a nation; but the scientists at the meeting chose to seat Secchi, and the Italians were sent home. Given his international prestige, the Italian government allowed Secchi to keep his observatory at the Roman College even after the college itself had been confiscated in 1870. However, following Secchi's death in 1878, all its instruments were confiscated and moved to an Italian state-supported observatory (Chinnici 2019).

Thus, when, at the suggestion of Secchi's former assistant Fr. Francesco Denza, Pope Leo XIII decided in 1891 to establish some sort of scientific institution, the obvious choice was to set up an astronomical observatory. The tradition of national observatories such as those in Greenwich, Paris, and Washington DC (which performed pure astronomy along with their practical functions in timekeeping and nautical almanacs) meant that such an observatory could be seen as a symbol of nationhood, an important factor since many nations—notably Italy at that time—still did not recognize the Vatican's independence. Furthermore, with Secchi's achievements still fresh in everyone's memory, the Vatican already had a solid reputation in the field. Furthermore, unlike meteorological networks, natural history museums, or botanical gardens (which were being founded in many other national capitals at that time) an astronomical observatory did not require an extensive, expensive, or expansive infrastructure.

In 1879, the year after his election, Pope Leo XIII published a major encyclical, *Aeterni Patris*, on the importance of scholarship. Primarily an endorsement of the theology and philosophy of Thomas Aquinas, it contains a notable statement about the natural sciences:

Our philosophy can only by the grossest injustice be accused of being opposed to the advance and development of natural science . . . in this very age many illustrious professors of the physical sciences openly testify that between certain and accepted conclusions of modern physics and the philosophic principles of the schools there is no conflict worthy of the name.

Note that the issue before Pope Leo XIII at that time was the accusation that the Church was opposed to the advance and development of natural science. Here he provided not only a defense of science, but a defense of its advance and development. To him science was not seen as a static set of knowledge. The final edition of Darwin's *The Origin of Species* and his *The Descent of Man* had already been published eight years earlier, in 1871; Kelvin's estimate of the Earth's age had been some 15 years in print. (Kelvin had calculated that the Earth was hundreds of millions of years old, much older than Biblical inferences, though still far younger than modern calculations.) As noted above, Pope Leo had a particular interest in intellectual pursuits and the modern world; he certainly would have been aware of Darwin's work, and possibly Kelvin's. Whether or not he agreed with them, this encyclical argued that attempting such work is not in and of itself something to be denied, challenged, or feared.

However, what is also telling is the argument behind why advances in science should not be feared: it is because "illustrious professors" have argued that the "certain and accepted conclusions" of modern science do not conflict with classical philosophy. To put it simply, one could conclude that to Pope Leo XIII, philosophy was still more important than the natural sciences, and that any science that did not accord with philosophy could be presumed to be not "certain and accepted." There was no sense that natural science in and of itself might make significant contributions to philosophy.

Twelve years later, when he established the modern Specola Vaticana, his *Motu Proprio* had this explanation:

In the meantime the Church has not neglected those disciplines which investigate nature and its forces. Schools and museums have been founded so that young scholars might have a better opportunity to deepen those studies. Among the Church's children and ministers there are some illustrious scientists whom the Church has honored and assisted as much as she could, by encouraging them to apply themselves with complete dedication to such studies.

Among all of these studies astronomy holds a preeminent position. . . . The Church's pastors were motivated, among other considerations, to see to progress in this science and to support its followers by the possibility that it alone offered to establish with certainty those days on which the principal religious solemnities of the Christian mystery should be celebrated. (These and all subsequent citations of the popes, unless otherwise noted, are as quoted in [Consolmagno 2009](#))

Again, notice the three particular items that he draws attention to: the preeminent position of astronomy; that its study reflects well on the honor of the Church, showing that it supports science; and that there is utility in astronomy for setting liturgical dates. While the latter issue might seem to have been a settled issue after the Gregorian Calendar reform of 1582, in fact, ever since then various suggestions for improvements have constantly been floated, including a suggestion of a small change (never followed up) in an encyclical by Pope Clement XI in 1703. Such suggestions continue even to the present day ([Casanovas 2009](#)).

Later in the document, he explicitly states that his motive for establishing the Specola is so that “ . . . everyone might see clearly that the Church and her Pastors are not opposed to true and solid science, whether human or divine, but that they embrace it, encourage it, and promote it with the fullest possible devotion.” Thus, he makes clear that, to him, the primary function of the Observatory and by connection the primary utility of astronomy to the Church is confined to the honor that it gives the Church and its scholarship.

3. Pius XI and Pius XII: Astronomy as Prayer

The Popes who followed Leo XIII—Pius X and Benedict XV—continued their support of the Specola Vaticana. One can assume that they were motivated by the same issues that had led Leo to establish it: a wish to maintain the sovereignty of the Holy See and a desire to defend the Church against attacks that it was opposed to science. However, by 1930, two events had caused the Papacy to re-examine the state of the Specola.

The first was the recognition of the Vatican City State as an independent nation by the Italian government in 1929. This meant that the Vatican might no longer feel the same need for overt signs of “statehood” such as a national observatory.

The second was the death of its long-time director, Fr. Josef Hagen SJ (1847–1930), on September 5, 1930, at the age of 83. After Hagen's death, Fr. Johan Stein SJ (1871–1951), who had worked with Hagen from 1906–1910, was appointed to succeed him as director.

With the Lateran treaty not only was the Vatican City State established, but also certain traditionally papal properties that had been confiscated by the government, notably the papal summer home in Castel Gandolfo, were restored to the Papacy. Stein proposed that the Specola move from its cramped and now light-polluted location on the walls of the Vatican to the papal villas in Castel Gandolfo. This site had both the dark skies needed for new telescopes, and room for a spectrochemical laboratory. The Pope agreed and thus the Specola was in essence reborn at a new location, with new facilities and a new staff of young scientists.

Two new telescopes on the roof of the Papal Summer Palace were dedicated by Pope Pius XI on 29 September 1935. At that time the Pope delivered an inaugural address that indicated a new way that astronomical research could benefit the mission of the Church. He began with the well-established theme of how support of astronomy gives honor to the Church, including a note of the double-meaning of the word heavens:

Today we officially inaugurate the Astronomical Observatory and the Astrophysical Institute. The high quality of the scientific instrumentation which has been acquired and the proven expertise of the scientists who will use it will undoubtedly make some important contributions to the progress in research of a science which, as a study of the heavens, can be said to be sovereign among the sciences.

What goes unsaid, presumably because it did not need to be said, was any reason why “studying the heavens” could be said to be sovereign among the sciences. However, he immediately follows this statement with the comment, “But this is not the only reflection which brings joy to our hearts today,” suggesting that he wishes to indicate a new motivation for this work. He then notes the historical precedents (which had been outlined previously by Fr. Stein):

What we are doing today, and your presence my beloved sons and daughters makes it all the more beautiful and solemn, adds some lines to the truly golden and most glorious pages which have already been written about the history of the Roman Pontificate. It carries us, like winged Pegasus, through the centuries in an immense and magnificent world of things, of ideas, of happenings.

Our dear and most capable Father Stein has given us a simple, but wise and most tasteful, account of that world. His brief history has for a moment thrown light upon and opened our eyes to the unfathomable depths of the heavens. We have been able to capture and enjoy at least a few notes from that immense hymn from on high where the heavens and the heavenly bodies sing the glory and reveal the power and the wisdom and the infinite beauty of the Creator.

Although linking the glory of the heavens to the glory of the Creator is a theme as old as the Psalms, this is a new note for a Pope to be taking in justification of the Specola Vaticana.

And one might say that the Creator himself, He who at the end of his work of creation was pleased and proclaimed that all was good, is in a special way pleased with the magnificence of the heavens and the stars.

At this point, the Pope returns to the apologetic value of the observatory, and how the existence of the observatory can make an important point countering the still-prevalent theme of a conflict between science and faith, again referring to ancient ideas tying together things seen in the sky with the abode of the gods:

We should not be amazed then if the magnificent matters which astronomy studies and helps us to better understand, and if the ideas which are raised by even the most ordinary but solid view of those matters, become the source of a profound spirituality. I am referring to the relationship between Religion and the Science of the heavenly bodies which has reigned continuously over the centuries from the most remote antiquity to our times. The most recent important Congress of the Orientalist in Rome has also reminded us of this relationship and treated of it in some of the papers. Information from ancient cuneiform and hieroglyphic texts have helped us to understand how observations of the heavens were related to sacrifices and cultic practices. All of this is now well known. It is only yesterday, in comparison with those antiquities, that the reform of the calendar took place.

Yet, at this point, the Pope signals that he is going in a new direction in the relationship between Church and science. In fact, in 1936, he would re-establish the historical Academy of the Lynxes (established by Pope Pius IX in 1847) and reconstitute it as the Pontifical Academy of Sciences. Here, with regard to this astronomical institution, he notes:

As you see, what we are doing here is not just to continue and to imitate, within our resources, the patronage of Our illustrious predecessors who have never been sufficiently praised for what they did. It is not just that we are trying to assure for the present and future, as they did for the past with the quiet eloquence of their accomplishments, to assure I repeat that implicit, even explicit, defense of the Faith and of Religion. That defense shines and is more than ever persuasive whenever respect for the faith is joined in a spontaneous way with the development of Science.

That which we are doing now is more than all of that. We are taking up once more one of the threads of the history of the Roman Pontificate and it is a beautiful and precious one. That is the thread of its relationship over the centuries with the science of the heavenly bodies, a science one might in all truth say is by its nature religious, just like, as Tertullian so nicely phrased it, the human soul is naturally Christian.

From this comes the new insight: that studying astronomy is not only a study of creation and thus the Creator, but that because of the history described above the study of astronomy in particular is especially appropriate to the Church:

From no part of Creation does there arise a more eloquent or stronger invitation to prayer and to adoration . . . It seems to us, dear sons and daughters, in this astronomical, may we call it, inauguration that we are fulfilling in the name of the whole Church, an act of our priestly ministry.

This is new. The Pope is saying here that to do astronomy is to participate in an act of prayer. Implicit is the understanding that astronomy has a value beyond bringing honor in a general way to the institutional Church. It is of value in and of itself; it is an activity completely in accord with the core function of the Church's religious duties.

He concludes by proposing a motto for the newly founded Observatory. This motto was inscribed on a plaque that remains to this day mounted on the wall of the structure housing the 1935 telescopes, and within the headquarters of the Specola in Castel Gandolfo:

Fr Stein recalled for us the imposing inscription ordered by Pius IX to be placed on the Pontifical Observatory of the Roman University on the Capitoline, an observatory which he had constructed: Deo Creatori (to God, the Creator). We could do no better than to follow in the wake which Our glorious predecessor so brilliantly left open and to complete his thought by Ourselves declaring and inscribing on the new Specola: Deum Creatorem Venite Adoremus (Come let us adore God the Creator).

Four years later, in 1939, Pope Pius XII was elected to the papacy in the turbulent months just before the beginning of the Second World War. Among his other qualities, he was personally fascinated by science, especially astronomy, and he had a particularly close relationship to the Specola Vaticana. For example, when the Observatory was looking to upgrade their pre-war telescope equipment in the 1950s, he provided the funding out of his own personal family fortune for a new Schmidt telescope that was constructed in the summer gardens.

In 1939, soon after his election, he delivered an address to the Pontifical Academy of Sciences where he offered a striking image of the role of astronomy as a form of prayer (Pius XII 1939):

Man ascends to God by climbing the ladder of the Universe; the astronomer, when reaching the sky, footstool to the throne of God, cannot remain an unbeliever before the voice of the firmament; from beyond the suns and astral nebulae emanates the thought, followed by the love and adoration, which sails toward a sun which illuminates and gives warmth not to the clay of man but to the spirit which animates him.

This poetic vision obviously builds on the sentiment expressed by his predecessor. Astronomy in particular is called out as having a special value in guiding the participant toward the traditional forms of prayer associated with the Church. However, Pius XII also shared the ideas seen in the writings of Pope Leo XIII that astronomy could also be called into the service of supporting the traditional philosophical underpinnings of theology. In his 1951 address to the Pontifical Academy of Sciences (Pius XII 1951), "The Proofs for the Existence of God in the Light of Modern Natural Science," he said:

Contrary to rash statements in the past, the more true science advances, the more it discovers God, almost as though He were standing, vigilant and waiting, behind every door which science opens. Furthermore, we wish to say that not only does the philosophical thinker benefit from this progressive

discovery of God, achieved in the increase of knowledge—and how could he do otherwise?—but those also profit who participate in the new discoveries or who make them the object of their considerations. The genuine philosophers especially benefit from it, since, by using the scientific advances as a springboard for their rational speculations, they can achieve greater security in their conclusions, clearer illustrations in possible obscurity, more convincing support in finding ever more satisfactory answers to difficulties and objections...

Science, which has encountered the Creator in its path, philosophy, and, much more, revelation, in harmonious collaboration because all three are instruments of truth, like rays of the same sun, contemplate the substance, reveal the outlines, and portray the lineaments of the same Creator.
(Pius XII 1951)

In this document we find two attitudes that would later be rejected, or at least toned down: the sense that astronomy was subservient to the needs of theology and philosophy, and the idea that scientific evidence could be applied to a “proof” of the existence of God. To that end, however, the Pope happily cites scientific evidence such as the billion-year ages of the Earth and the universe, which shows a freedom from more restrictive “literalistic” interpretations of Scripture. However, in his attempt to show that science could be seen as agreeing with a Scripture in the presence, for example, of the necessity of a beginning point, this text came perilously close to *concordatism*, the fallacy that one can and should read scripture and faith as speaking in agreement of the same matters.

Even though the Pope softened his argument toward the end of his presentation by conceding that “the facts verified up to now are not arguments of absolute proof of creation in time . . . ” the concordatism tendency could be found almost immediately afterwards, where he suggested that one should “still wait for further investigation and confirmation, and theories founded upon them have need of new developments and proofs, in order to offer a secure basis to a line of reasoning which is, of itself, outside the sphere of the natural sciences.” Indeed, this appeared to many people to be an endorsement of a particular cosmology theory, popularly known as the “Big Bang.”

The most startling reaction against this speech came from Fr. Georges Lemaître, the Belgian diocesan priest and astrophysicist whose work in the 1920s actually laid the foundation for the Big Bang theory. Lemaître was very leery at reading such an interpretation of his theory.

For one thing, he recognized that his theory was still controversial, and only one of several possible cosmologies given the evidence available at that time. (It would be more than a decade before the discovery of the cosmic microwave background radiation finally convinced most cosmologists that some sort of “big bang” actually did occur.) Worse, in 1951 there was still some suspicion that this priest’s theory might have been invented precisely to find a scientific excuse to support the Genesis description of “fiat lux.” Lemaître wanted his work to be judged purely on its scientific merits. He knew that even the best scientific theory is eventually superseded by later work. Moreover, in any event, while it is good that theologians be aware of the latest advances in science, it is certainly not theology’s role to judge or endorse scientific theories. Nor, for that matter, is it wise to base theology on the latest advances of science, since that is a ground that is forever shifting.

Lemaître spoke personally to the Pope about his concerns. Clearly, he was heard. The following year, the International Astronomical Union (of which the Vatican is a member state) met in General Assembly in Rome, and the Pope was invited to address the assembled astronomers. In his address, of September 8, 1952, the Pope presented an overview of astronomical knowledge prepared with the assistance of the Director of the Vatican Observatory, Fr. Daniel O’Connell SJ.

In this address, the Pope reflected on the deeper implications of the very nature of the astronomical enterprise. However, rather than attempting philosophical or theological arguments, his presentation concluded with a very personal reflection of the nature of love to be found the Universe:

What a happy and sublime encounter over the contemplation of the cosmos is that of the human spirit with the Spirit of the Creator! . . . The divine Spirit reveals itself from the coldness of space to the scientist open to finding a purpose for the whole of existing reality:

Spirit moved by a breath of goodness and love penetrating and explaining all which focuses and reveals itself, particularly in the human being made in its image and likeness.

Astronomy was no longer merely an apologetic tool for the Church or only an inspiration to engage in traditional forms of prayer. Instead, it was recognized to be, in itself, a profound act of worship: a route to a deeply personal encounter with the Creator.

The address was presented in French, and not widely distributed afterwards. The English translation from which this was taken was prepared by Fr. Pavol Gabor of the Vatican Observatory in 2009.

4. Pope John Paul II: Astronomy as Partner

In 1987 the Pontifical Academy of Sciences held a study week in honor of the 300th anniversary of Newton's *Principia*. Following that event, Pope John Paul II prepared a letter to Fr. George Coyne S.J., the director of the Vatican Observatory, outlining his thoughts on the relationship between science and religion; the letter was published in the study week proceedings. In it, he took the insights of the previous Popes in a new direction. Not only did he find value in science, in and of itself; he also recognized the scientific enterprise as an activity that was parallel, and equal, to the work of theology.

He began by recognizing how science and the intellectual world interacted (all quotations from [John Paul II 1988](#)):

The Church and the Academy engage one another as two very different but major institutions within human civilization and world culture . . . there has been a definite, though still fragile and provisional, movement towards a new and more nuanced interchange. . . . It is crucial that this common search based on critical openness and interchange should not only continue but also grow and deepen in its quality and scope.

It was important that these enterprises were recognized as independent and equal. Only in that way could a fruitful dialogue, and thus mutual understanding, be promoted. He also refused to pre-judge what fruit that dialogue might produce in the future.

. . . we must overcome every regressive tendency to a unilateral reductionism, to fear, and to self-imposed isolation. What is critically important is that each discipline should continue to enrich, nourish and challenge the other to be more fully what it can be and to contribute to our vision of who we are and who we are becoming.

The key was a sense of the equal value of science and religion; without it, such dialogue was pointless. What resulted was a call to recognition of science at a level that the preceding Popes would never have considered:

. . . To be more specific, both religion and science must preserve their autonomy and their distinctiveness. Religion is not founded on science nor is science an extension of religion. Each should possess its own principles, its pattern of procedures, its diversities of interpretation and its own conclusions.

It was not mere dialogue for dialogue's sake that he was calling for here. Pope John Paul II specifically calls out areas where astronomy and the other sciences can, and ought to, have a profound effect on the way the Church understood itself and its relationship with God.

. . . If the cosmologies of the ancient Near Eastern world could be purified and assimilated into the first chapters of Genesis, might not contemporary cosmology have something to offer to our reflections upon creation? . . . What, if any, are the eschatological implications of contemporary cosmology, especially in light of the vast future of our universe?

Yet, he also argued that this dialogue was essential to progress within science itself: not in the sense that religion would favor one scientific result over another, but rather in the role that science

played in the wider human culture. In the following passage he planted the seeds of an understanding of science as a human endeavor, a thread of human culture, which Pope Francis would later develop in *Laudato Si'*.

... Can science also benefit from this interchange? It would seem that it should. For science develops best when its concepts and conclusions are integrated into the broader human culture and its concerns for ultimate meaning and value. Scientists ... can also come to appreciate for themselves that these discoveries cannot be a genuine substitute for knowledge of the truly ultimate. Science can purify religion from error and superstition; religion can purify science from idolatry and false absolutes. Each can draw the other into a wider world, a world in which both can flourish.

He also recognized that science inevitably plays a role in the way that human beings, living in a scientific culture, will understand their religion. It is not a question of whether science and religion should interact, but a recognition that inevitably they do interact. The issue then, is to have some sort of awareness of how that interaction is occurring:

Christians will inevitably assimilate the prevailing ideas about the world, and today these are deeply shaped by science. The only question is whether they will do this critically or unreflectively, with depth and nuance or with a shallowness that debases the Gospel and leaves us ashamed before history. Scientists, like all human beings, will make decisions upon what ultimately gives meaning and value to their lives and to their work. This they will do well or poorly, with the reflective depth that theological wisdom can help them attain, or with an unconsidered absolutizing of their results beyond their reasonable and proper limits.

If there was one take-away from this lengthy discussion, it can be found in a key sentence from a passage cited above: "Science can purify religion from error and superstition; religion can purify science from idolatry and false absolutes."

5. Pope Francis: Astronomy as an Integral Part of the Human Purpose

In the letter from Pope John Paul II cited above, we find the sentence, "science develops best when its concepts and conclusions are integrated into the broader human culture." This integration of science into the fabric of human life was first hinted at by Pope Pius XII, when he noted in his IAU address that "the divine Spirit reveals itself from the coldness of space to the scientist open to finding a purpose for the whole of existing reality." The indivisibility of the human being, who is at the same time living in the physical world that is studied by science and the cultural world beset by questions of purpose, ethics, and desires, is the key insight that forms the basis of Pope Francis's understanding of what science is and why it is important.

A hint of this integration can be found specifically in an address that Francis gave to the Vatican Observatory Summer School students in 2016: "Scientific research... can, and should be, a source of deep joy ... through us this universe can become aware of itself and of its Maker. This is the gift, and the responsibility, given to us as rational creatures in this cosmos." It is not enough that we do science; we also need to reflect on why we do it. He identifies the ultimate motivation as a search for joy, which he identifies as an awareness of the presence of God.

This theme was woven throughout the Pope's most significant work on the role of science in our culture, his encyclical *Laudato Si'* (Francis 2015).

Directly speaking about the relationship of humankind with the physical universe, particularly in the light of global climate change, the theme is set early on in this document: "Climate change is a global problem with grave implications: environmental, social, economic, political and for the distribution of goods." [paragraph 25]. He immediately ties both the physical and social sciences together, recognizing that progress (or errors) in the one can create effects in them all. Within this setting there are three points in this document which touch on the theme of our work.

First, it reemphasizes the nature of the Biblical description of the created world as a theological, not a scientific description. He does this both by examining its historical roots, and by differentiating what he calls “nature,” the physical universe studied by science, and “creation,” which is nature set in the context of a Creator. In this way, his teaching is far removed from any sort of fundamentalist literalism or concordatism. Recognizing that the Genesis account of creation in many ways sets the tone for how the Church deals with the physical world, it begins by examining what is actually said there and noting that its core message is not about nature itself but the relationships between God, nature, and humanity:

The creation accounts in the book of Genesis contain, in their own symbolic and narrative language, profound teachings about human existence and its historical reality. They suggest that human life is grounded in three fundamental and closely intertwined relationships: with God, with our neighbor and with the earth itself. According to the Bible, these three vital relationships have been broken, both outwardly and within us. This rupture is sin. (Paragraph 40)

The creation of Genesis and the nature studied by science both refer to the same material reality, but the Pope notes that “the word ‘creation’ has a broader meaning than ‘nature’ . . . Nature is usually seen as a system which can be studied, understood and controlled, whereas creation can only be understood as a gift from the outstretched hand of the Father of all, and as a reality illuminated by the love which calls us together into universal communion.” [76] Religious texts are thus about “creation” as a gift of love, rather than attempts to understand and control the physical universe. Nonetheless, another effect of this description of nature in scripture is that it “ . . . demythologized nature. While continuing to admire its grandeur and immensity, it no longer saw nature as divine.” (Paragraph 78).

Next, with the introduction of “sin” as a rupture of the vital relationships between creation of Creator, science itself as an activity of human beings is thus inexorably tied to the human experience of joy and of sin. Thus, whatever science we do is both motivated and bound by that human experience. Science is seen as an essentially human act which, for that reason, participates in both joy and sin. It is not merely something that might be useful to cite but which is otherwise separate from the religious person; it is more than a tool that a religious person might use to reach God; it is more than an independent route to truth that complements religion. It is one of the essential activities that makes us human.

Finally, it deliberately conflates science with the technology that it enables. We cannot pretend that science is neutral, because to do so denies both its benefits and its dangers. If it had no danger, it would have no value.

Certainly, science itself and its associated technology is to be appreciated—not only for its utility in easing our daily work or improving our health, but also as a medium for all those activities that make us human. It makes new kinds of art possible; and it is, in itself, a new kind of art. However, precisely because it is a great power for good, it must inevitably require a greater need for responsibility:

It is right to rejoice in these advances and to be excited by the immense possibilities which they continue to open up before . . . Technoscience, when well directed, can produce important means of improving the quality of human life . . . It can also produce art and enable men and women immersed in the material world to “leap” into the world of beauty . . . art and music now make use of new technologies . . . Yet it must also be recognized that . . . our immense technological development has not been accompanied by a development in human responsibility, values and conscience. Each age tends to have only a meagre awareness of its own limitations . . . the scientific and experimental method in itself is already a technique of possession, mastery and transformation... Men and women have constantly intervened in nature, but for a long time this meant being in tune with and respecting the possibilities offered by the things themselves. (Paragraph 102–4)

Indeed, the problems that can arise from technology are precisely those that confuse the results of technology with those of philosophy.

It can be said that many problems of today's world stem from the tendency, at times unconscious, to make the method and aims of science and technology an epistemological paradigm which shapes the lives of individuals and the workings of society. The effects of imposing this model on reality as a whole, human and social, are seen in the deterioration of the environment, but this is just one sign of a reductionism which affects every aspect of human and social life. We have to accept that technological products are not neutral, for they create a framework which ends up conditioning lifestyles and shaping social possibilities along the lines dictated by the interests of certain powerful groups. Decisions which may seem purely instrumental are in reality decisions about the kind of society we want to build ... scientific and technological progress cannot be equated with the progress of humanity and history. (Paragraph 113)

The activity of science and the use of its resulting technology thus must be accompanied with deeper moral questions, those normally thought to be the realm of ethics or philosophy. For the astronomical sciences, which generally have not been thought to be promoters of new technology, this might seem to be irrelevant. However, what is being asked here is more than just worrying if something might be misused; it also demands that we build into our uses an examination of a just distribution of both benefits and costs.

In any discussion about a proposed venture, a number of questions need to be asked in order to discern whether or not it will contribute to genuine integral development. What will it accomplish? Why? Where? When? How? For whom? What are the risks? What are the costs? Who will pay those costs and how? ... Any technical solution which science claims to offer will be powerless to solve the serious problems of our world if humanity loses its compass, if we lose sight of the great motivations which make it possible for us to live in harmony, to make sacrifices and to treat others well. (Paragraph 200)

At the very least, astronomy is too often seen as a luxury of privileged societies. If astronomy has an intrinsic value *per se*, then that value is too often not available to everyone. The biennial Vatican Observatory Summer Schools, such as the one addressed by Pope Francis as quoted above, are specifically designed to attract students from the developing world as a way to address this issue.

The third essential point is a recognition that ultimately goodness can come from science and technology, and this goodness is a pointer to God. The document closes with a hymn of praise for the possibilities of science and technology, not in terms of their utility but with rejoicing in the joy of knowledge itself: "At the end, we will find ourselves face to face with the infinite beauty of God (cf. 1 Cor 13:12) and be able to read with admiration and happiness the mystery of the universe, which with us will share in unending plenitude." (Paragraph 243)

6. Discussion: Astronomy and the Peaceful Uses of Space

The Church first engaged astronomy in support of making more reliable liturgical calendars, and as a description of the cosmology that formed the basis of its philosophical and theological studies. The Popes' views of astronomy especially after 1891 also recognized that supporting science could be useful for apologetical purposes, to put the Church in a good light.

Yet, early on there was also a realization that astronomy supported a prayerful attitude, that contemplating the night sky provided a reminder that the universe and its Creator are larger than our immediate worries and fears. By the end of the 20th century, astronomy (and science in general) was also recognized as an independent path to truth, with its own necessary freedom and autonomy. By the time of Pope Francis, this grew to a realization that because science was an essentially human activity, it carried with it both the joy and the dangers of a humanity that was both fallen and redeemed.

Meanwhile, an essential change occurred in astronomy and its associated technology during this era. At the end of the 19th century, studying the universe outside of planet Earth was entirely a passive enterprise; unlike chemistry or biology, nothing that astronomy itself taught us could be seen to be actively altering the physical world where humans lived.

With the beginning of the space age, this age of innocence ended. Near-Earth space became a platform from which humans could observe our own planet. These data could be gathered, shared, or sold for purposes that might be peaceful, commercial, or hostile. And by the early 21st century, the Moon and asteroids began to be seen as potential mineral resources to be exploited ... and fought over.

In the early years of the space age, papal pronouncements were generally limited to prayers for the safety of the astronauts, notably Pope Paul VI's message to the Apollo 11 astronauts delivered on live television from the telescope domes of the Vatican Observatory on the occasion of the first lunar landing, 20 July 1969; and his prayers for the astronauts of the crippled Apollo 13 mission on 15 April 1970.

The first specific mention of space exploration at the Pontifical Academy of Sciences was a study week under Pope John Paul II in October, 1984, titled "Impact of Space Exploration on Mankind." The Pope's comments to that gathering emphasized the wish that the benefits of space travel would be made available to the benefit of all:

These various modes of man's presence in space lead us to ask a question: to whom does space belong? While space was something merely observed and studied by the human eye, though with the aid of powerful astronomical instruments, this question was not yet asked. But now that space is visited by man and his machines, the question is unavoidable: to whom does space belong? I do not hesitate to answer that space belongs to the whole of humanity, that it is something for the benefit of all. Just as the earth is for the benefit of all, and private property must be distributed in such a way that every human being is given a proper share in the goods of the earth, in the same way the occupation of space by satellites and other instruments must be regulated by just agreements and international pacts that will enable the whole human family to enjoy and use it. (John Paul II 1984)

In 1967, the United Nations promoted an International Treaty on the Peaceful Uses of Space. Fifty years later, the outlines of this treaty were being challenged. Governments with significant space capabilities, such as the United States and China, were reinterpreting or ignoring aspects of that treaty. Small nations such as Luxembourg and the Isle of Man who had not been seen as likely players before, found that their minor status allowed them possible legal loopholes that made them attractive places where corporations could be set up to exploit the resources of space, both tangible and intangible. Such corporations, and multinational consortia such as the European Space Agency, were not envisioned in 1967, much less signatories of the original treaty.

In 2018, the United Nations Office of Outer Space Activities (UNOOSA) celebrated the 50th anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space by hosting an international meeting, UNISPACE+50, in Vienna. Several months before this meeting, the Vatican Observatory hosted a workshop sponsored by the UNOOSA with more than two dozen experts from international organizations, governments and non-governmental organizations, as well as representatives of the private sector and research institutions and leaders from the diplomatic arena. As noted in the official UN report following the workshop, "The Holy See has a strong interest in matters related to the protection of the environment, and Pope Francis has repeatedly called for us to globally address the defining challenges of our time. Thus, [this seminar] provided a suitable framework for an exchange on how space science and technology can directly and indirectly escort the common global efforts to address climate change and the goals set in the Sustainable Development Goals." The meeting ended with a personal greeting to the attendees from Pope Francis at his Wednesday audience.

Following this meeting, the Vatican Secretary of State requested that the director of the Vatican Observatory serve as the head of the Vatican delegation to the UNISPACE+50 meeting, where he presented the official Vatican position on the peaceful uses of outer space (Consolmagno 2019a, 2019b):

In seeing the Earth from space, we realize that our own borders are insignificant in comparison. The Earth's atmosphere is a global environment that needs to be protected by a global vision of this limited, shared natural resource and must be utilized for the benefit of all humankind ... Space

Accessibility should be understood to include accessibility to space-derived data and services for everyone on Earth, not just accessibility to the outer space environment for conducting research.

Speaking of the work of our seminar, the Vatican statement noted:

The discussion at the Seminar noted the numerous opportunities for the public's involvement in space science provided by the space community and the need for greater engagement with the public, as well as greater transparency by countries in the sharing of data, policies and motivations for space research . . . We need to reflect on how we can transform the paradigm of the space economy from one of making very expensive space services and products available to a few people, to one that harnesses the abundance of space-derived data and services for the good of all.

And finally, it concluded:

All nations share a common border with outer space, so all nations would be equally near such an area of conflict. Conflict in space would inevitably escalate tensions on Earth, and the effects of armed conflict in space would affect all present in outer space, whether they are combatants or not. The Holy See therefore, implores all States to maintain the peaceful uses of outer space—for the good of all and our one common home.

At the same time that Popes were recognizing how astronomy was deeply entwined with the human person, whose joys and desires color the way we study the universe, we have become all the more aware of how the possible exploitation of space made possible by astronomy carry with them ethical and social dimensions (Consolmagno 2019a, 2019b).

In an age of in-situ space exploration, the famous linguistic quip of Cardinal Baronius takes on a new meaning. Our religion tells us not only how to go to Heaven; it reminds us of how we ought to behave when we go into the Heavens.

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Article

The New Frontier: Religion in America's National Space Rhetoric of the Cold War Era

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Abstract: The origins and use of national space rhetoric used by NASA, the US government, and the media in America began during the Cold War era and relied, in part, on religious imagery to convey a message of exploration and conquest. The concept of space as a “New Frontier” was used in political speech, television, and advertising to reawaken a sense of manifest destiny in postwar America by reviving notions of religious freedom, courage, and exceptionalism—the same ideals that originally drove expansionist boosters first to the New World and then to the West. Using advertisements, political speeches, NASA documents, and other media, this paper will demonstrate how this rhetoric served to reinforce a culture held by many Americans who maintained a long tradition of believing that they were called on by God to settle New Frontiers and how this culture continues to influence how human spaceflight is portrayed today.

Keywords: New Frontier; spaceflight; rhetoric; pioneer; nationalism; exceptionalism; manifest destiny; religion; NASA; astronauts

1. Introduction

Frederick Jackson Turner claimed that the American frontier had shaped America and defined the characteristics of being American. Turner was an American historian whose “frontier thesis” posited that the Western Frontier drove American history and, as a result, explained why America is what it is. The frontier concept facilitated a certain rugged individualism in those who explored it. In this manner, Turner argued, the story of this continual westward push “with its new opportunities, its continuous touch with the simplicity of primitive society, furnished the forces dominating American character” (Turner 1998, p. 27). Turner’s seminal essay outlining his thesis was first presented at a special meeting of the American Historical Association at the World’s Columbian Exposition in Chicago in 1893 and published later that same year. Well regarded for many years, Turner’s framing of American history began to be challenged in the early 1940s.

In *Destined for the Stars: Faith, the Future and America’s Final Frontier*, Catherine L. Newell expands on Turner’s argument that outer space is a frontier waiting to be explored, arguing that the foundation of the conquest of space is actually a religious endeavor (Newell 2019, p. 12). From the end of the Second World War to the beginning of the Cold War, Newell contends that the exploration of space was a “spiritual necessity” that resulted from our need “to escape the inevitable cataclysm that would befall Earth” (Newell 2019, p. 4). She contends that the exploration of space was not undertaken solely as a result of technological or economic superiority or by a national effort motivated by political and ideological fears. Rather, the success of the US space program was due to “a culture that had long valued faith above other religious feeling and believed they were called by God to settle new frontiers and to prepare for the end of time” (Newell 2019, p. 5). The move west, which began with a fear that the end of the world was coming and that the New World needed to be purified of the sins of the Old, led to the conquest of the frontier. This was then interpreted, by extension, as a religious calling,

a divine sign that God had a hand in the lives of His chosen people. Newell concludes that this idea mapped perfectly onto a future in space because after all “how could a country that had tamed the great North American frontier not succeed in conquering the final frontier?” (Newell 2019, p. 17).

With the closing of the American frontier, there emerged an active campaign during the Cold War to try and reinvent that nineteenth-century faith as described by Newell by replacing the old frontier of the American West with the New Frontier of outer space. In describing space as the New Frontier, I show how most Americans first came to interpret, understand, and support space exploration through a campaign that began with John F. Kennedy’s successful “New Frontier” presidential bid of 1960, which reawakened a sense of manifest destiny in postwar America by reviving the same ideals that characterized the pioneers that opened the now closed Western frontier. Kennedy depicted human spaceflight as a great pioneering adventure, an epic saga that made it possible for the early space program to thrive not only in the eyes of the public, but also in the chambers of Congress.

An examination of the rhetoric of the New Frontier requires not only historical context but also an analysis of the elements that make up a good saga such as a conquerable location, a malevolent antagonist, and a heroic adventurer. Add to this the spiritual justification that Newell argues never really went away, and together, you now have a narrative appealing to a Cold War audience nervous about nuclear annihilation. This essay identifies these narrative elements and illustrates how they were adapted and applied to the New Frontier of outer space.

The New Frontier rhetoric spread to NASA, which became a federal agency just a few years before Kennedy first took office as president in 1961 (Kennedy 1961a). In *Space: The New Frontier*, one of the first popular publications produced by NASA shortly after the agency’s formation in 1958, I show how NASA sought to capitalize upon the New Frontier narrative to help educate a skeptical public about the new agency’s goals and to help convince a reluctant Congress to fund its programs. The influence of James Fletcher, one of the longest serving NASA Administrators, is also examined, revealing how his frontier-focused Mormon upbringing may have influenced his policies and ideals.

The use of the New Frontier theme as it appears in print media is explored, starting with the unique relationship that NASA had with *Life* magazine. NASA saw the magazine and its other publications as a vehicle for popularizing the space program. *Life*’s trademark oversized format with a heavy emphasis on photos provided a perfect forum to portray the enormity of outer space. Together, they successfully depicted the vastness of the New Frontier and all its awe and wonder to readers, many of whom could not help but see the spiritual allegory unfold on its pages. In addition, numerous trade publications sprang up in support of the growing field of aerospace, featuring advertisements illustrating hardware that were not only designed to get us into space, but also drawn to secure the contracts and hire the workers that would build it. Samples of this advertising are examined along with interpretations of their spiritual meaning.

Finally, this paper explores how the rhetoric of the New Frontier was used in television and other media, such as in Walt Disney’s newly opened Disneyland theme park and in assorted record albums to help further engage the public imagination, and concludes with a discussion of how a New-Frontier-influenced national space rhetoric and its associated religious overtones saw a resurgence in America since the end of the Cold War, particularly in space activism and policy that began under the Reagan administration that continues to this day.

2. Kennedy, Congress, and the New Frontier

The New Frontier was the name given to the Kennedy campaign for the Presidency. As John M. Logsdon writes, Kennedy may well have won the 1960 election “partly because of space-related issues”, which were a pivotal part of his campaign (Logsdon 1970, p. 64). In the 1985 Pulitzer Prize-winning book *The Heavens and the Earth: A Political History of the Space Age*, historian Walter A. McDougall points out that no single campaign issue “better symbolized” Kennedy’s “New Frontier” (McDougall 1985, p. 221).

On July 15, 1960, during the Democratic National Convention in Los Angeles, Senator Kennedy gave a speech upon accepting his Party's nomination as their candidate for the 1960 presidential election. Later known as "The New Frontier" speech, it featured Kennedy using the term "frontier" thirteen times. Two good examples include: "the new frontier of which I speak is not a set of promises—it is a set of challenges. It sums up not what I intend to offer the American people, but what I intend to ask of them" and "we stand today on the edge of a new frontier—the frontier of the 1960s—a frontier of unknown opportunities and perils—a frontier of unfulfilled hopes and threats" (Kennedy 1960a). In the spirit of Franklin Delano Roosevelt's New Deal, which itself was derived from Woodrow Wilson's New Freedom program, the phrase referenced the uncharted decade of the 1960s and how it could be perceived as a New Frontier for exploration.

In remarks given at a Civic Center in Denver not long after formally accepting the Democratic Presidential nomination, Kennedy said, "I think you can get a clear contrast between our two parties in the slogans the Presidents have run on in the 20th century. No Democrat ever ran on 'Stand pat with McKinley', or 'Keep cool with Coolidge', or 'Return to normalcy with Harding', or 'No new starts in 1960', or 'You never had it so good'. Our Presidents have run on the rights of man, with Thomas Jefferson, the New Freedom of Woodrow Wilson, the New Deal of Franklin Roosevelt, the Fair Deal of Harry Truman, and now we seek a New Frontier, not only for the United States, but for all those who wish to follow us on the road to freedom" (Kennedy 1960b).

For the Kennedy campaign, the New Frontier theme was first suggested by Walt Rostow, a member of Kennedy's Academic Advisory Group (AAG), who presented the idea to Kennedy at a cocktail party for the group held in Dierdre Haderson's home. It was also Rostow who wrote Kennedy's "New Frontier" speech (Harzis 1996, p. 33). The AAG was a small assembly of academics that Kennedy gathered to help advise him on policy and to draft speeches. Similar to the "Brains Trust", a group of academics from Columbia University that Franklin Roosevelt used to help draft his election campaign and later employed by his administration to craft the New Deal, the AAG was comprised of several dozen academics from in and around Boston. Kennedy began to assemble this group in 1956 when he first became a national public figure at the Democratic convention where he sought to become his party's Vice-Presidential nominee. Membership in the AAG was bipartisan and fluid. "Kennedy seems to have cared little for the various political persuasions of these scholars. He cared much more about their ideas and opinions," wrote Panagiotis Harzis, who explored the origins of the AAG (Harzis 1996, p. 5).

This AAG was highly effective in helping Kennedy incorporate the rhetoric of the old frontier to help define the symbolism and optimism of his New Frontier presidential campaign. David Zarefsky writes that President Kennedy's New Frontier campaign "became a meaningful symbol when it received widespread use and when the related images of discovery, exploration, charting a course, and pursuing the unknown were given expression" (Zarefsky 1986, p. 17). The AAG's guidance helped Kennedy give these images persuasive meaning by effectively depicting them in a frontier narrative that many critics found challenging to counter because the story was so persuasive.

The frontier adventure story transcends the debate on the pros and cons of the need for man to travel into space. Olin Teague, chairman of the powerful Manned Space Flight Subcommittee, noted that before the space race, America believed there were no more first-class "challenges", no more "new frontiers." He concluded that the idea of lunar exploration had "reawakened" America's "spirit of adventure and achievement" like nothing since "the days of the pioneers" (United States Congress 1963, p. 13855).

James Kauffman wrote in *Selling Outer Space: Kennedy, the Media, and Funding for Project Apollo, 1961–1963* that the Kennedy "administration also depicted the manned lunar landing in narrative form as a great frontier adventure, complete with heroes and villains. Although critics would question the political, scientific, military, and economic justifications for sending a man to the Moon, the frontier narrative went unchallenged. Both the media and Congress found the story irresistible. In short, the frontier narrative stood as the most powerful justification for a manned Moon mission" (Kauffman 1994,

p. 29). Kauffman concludes, “with the cold war in full swing, Americans wanted desperately to have faith in a viable narrative that held out hope for America’s future” (Kauffman 1994, p. 131). The space rhetoric used during the Kennedy Administration emphasized a deep-rooted frontier narrative in American history and culture that allowed the early space program to succeed. “Americans wanted to believe the myth of the frontier adventure”, said Kauffman, (Kauffman 1994, p. 131) and depicting human spaceflight as a great pioneering adventure, this myth could not easily be refuted by the media, public, or Congress. In describing space as the New Frontier, Kennedy paved the way for how Americans came to interpret, understand, and support space exploration by recreating part of America’s cultural mythology of its past.

During the 1960 presidential campaign, President Kennedy exploited a growing public concern about the space race that was fueled by an assertion of a “missile gap”, a fear-inducing falsehood that his party put forth at the expense of the Eisenhower administration. This feeling of technological inadequacy was further enhanced by a series of successive Soviet space spectacles that, when compared to early American launch failures, created a public fear that the United States had indeed fallen behind their Russian counterparts, especially in the production of missiles.

In the October 10, 1960, issue of *Missile and Rockets*, Kennedy issued a campaign statement on space: “We are in a strategic space race with the Russians, and we are losing . . . Control of space will be decided in the next decade. If the Soviets control space, they can control Earth, as in past centuries the nation that controlled the seas has dominated the continents. This does not mean that the United States desires more rights in space than any other nation. But we cannot run second in this vital race. To insure peace and freedom, we must be first . . . This is the new age of exploration; space is our great new frontier” (Kennedy 1960c, pp. 12–13).

For those who lamented the closure of the Western frontier, there now emerged the New Frontier of space that allowed fearlessness, rugged individualism, and other American qualities to re-emerge in the face of imminent danger posed by the Soviet Union. The added threat posed by a foreign power heightened the religious certainty that God wanted Americans to go out into space as the New Frontier. God would not let us fail, so what does He want us to do in space? That answer came less than three weeks after astronaut Alan Shepard splashed down in his Mercury spacecraft, marking the first time an American had flown into space. On 25 May 1961, President Kennedy addressed a joint session of Congress that included an audacious plan to land a man on the Moon.

3. Narrative Elements of the New Frontier

Kauffman points out that in order for the frontier narrative to be successfully applied to the New Frontier, adjustments had to be made. “To ring true, a frontier story must possess specific constituent elements: (1) an identifiable, conquerable geographic location that is (2) unknown and hostile and includes (3) a malevolent antagonist who is thwarted by (4) a heroic adventurer” (Kauffman 1994, p. 34). In addition, Janice Hocker Rushing in *Mythic Evolution of ‘The New Frontier’ in Mass Mediated Rhetoric* shows how Kennedy altered the frontier myth in order to relocate it from the pioneering frontier of America’s West to the New Frontier of space. In her work, Rushing suggests that central to a frontier adventure, one needs to define the “scene” and the “hero.” Rushing notes that the scene is an identifiable, tangible geographic location that could be conquered and dominated. However, this definition is difficult to apply to outer space. The physical act of going into space is a challenge but once that is done, what is there next? Unlike the “Old Frontier,” one cannot conquer space by simply going there or by having others occupy it, since space is infinite and can never be conquered by filling it up (Rushing 1986, p. 283).

Stephen Pyne notes that advocates who have expanded the story of Western American settlement to encompass space exploration encountered problems, because “discovery among the planets is qualitatively different from the discovery of continents and seas” (Sagan and Pyne 1988, pp. 14, 18). For the Kennedy Administration, this problem was solved by establishing a clear concrete goal for the space narrative of their New Frontier campaign: that of landing a man on the Moon. Landing men

on the lunar surface fulfilled not only an identifiable, conquerable geographic location, but was also unknown and hostile.

Space is harsh and full of danger, but by itself, it is not an effective malevolent antagonist. Something else is needed. In the Soviet Union, Kennedy found his needed malevolent antagonist in the Russians who, like the Native Americans that threatened expansion into the Western frontier, served to threaten America's entry into the New Frontier of space. Kennedy did not always call out the Soviets directly by name, but he was clear in pointing out that they sought "to dominate space" and their "intentions" toward it "may be hostile" (Kennedy 1961b, p. 560). NASA Administrator James Webb did not mince words, calling the Soviets "a powerful despotism, bent on burying us along with the basic tenets upon which our society rests and from which it draws its strength" (Webb 1961, p. 98).

The last element needed to successfully make a frontier story is a suitable hero. The "star voyager" or astronaut of the New Frontier of space had to exemplify traditional American values of the frontiersman of the West: courage, patriotism, and a fierce self-reliance, combined with the added qualities of humility, discipline, and religious devotion like those that characterized their Puritan ancestors. These pioneers of the New Frontier of space had to be part Daniel Boone and part Flash Gordon. America's first astronauts exemplified all of these traits. The press, members of Congress, and the general public all focused their attention on the astronauts, for "rarely were history's explorers and discoverers so clearly marked in advance as men of destiny" (Barr 1959, p. 7). Among the first seven astronauts that NASA selected for the Mercury program, one stood out as having exemplified all the traditional American values associated with our pioneer ancestors.

John Glenn was the quintessential American astronaut who held the enviable position of being more perfect than his NASA colleagues. "[America] found Glenn the man fully the equal of Glenn the astronaut" wrote *Time* magazine (Time 1962, p. 22). The media adored Glenn, and it was through them that the American public learned how the career Marine exemplified the heroic qualities of his Puritan pioneers that settled the Western frontier. According to *Time* magazine, "Glenn's modesty, his cool performance, his dignity, his witticisms, his simplicity—all caught the national imagination" (Time 1962, p. 22). However, it was his faith and not his adventures in space that garnered the most public attention.

The press described Glenn as "deeply religious" and reported that he and his family attended church "every" Sunday (Newsweek 1962, p. 20). In the eyes of the public, Glenn was the hero element of the frontier narrative. His orbital mission received the greatest amount of media coverage during the Mercury Program. He was portrayed as the heroic adventurer, one of many, like the courageous and patriotic early pioneers who adventured before him to settle the West. After his successful flight, Glenn was invited to give a speech before a joint session of Congress. During the speech, many members of Congress were visibly moved by what he said. Dora Jane Hamblin, in writing about Glenn's speech, described his words in near messianic terms, stating that it created "a deep silence, full of cleansing rejuvenating pride in him, his family, and the nation" (Hamblin 1962, p. 35). Glenn's flight offered a baptism that cleansed the nation of its transgressions caused by its late start in the race for space. His successful mission rejuvenated the nation toward believing it could reach Kennedy's goal of landing a man on the Moon before the decade was out. Glenn had spoken, and as Hamblin wrote, his "star-spangled sincerity evoked the pride of a nation of a far more innocent age" (Hamblin 1962, p. 34).

4. NASA and the New Frontier

Soon after NASA was formed, it issued *SPACE The New Frontier* (see Figure 1), an illustrated popular publication designed to help explain to the general public what the new federal agency was all about. The publication proved to be so popular that NASA continued publishing it over the next seven years, revising it to reflect its changing goals. In the first edition that came out in 1959, it featured a stylized Sun in the center of the cover, around which appear concentric painted orbits. Throughout the insides are samples of artwork depicting fictional rockets flying through space, imagery popular in the late 1950s and designed to capture the public's imagination.



Figure 1. Usage of the term “New Frontier” was not new, having been used to sell movies on the big screen such as the 1935 Western *The New Frontier* starring John Wayne. However, during the decade of the sixties, it increased in popularity due, in large part, to its adoption by John F. Kennedy as the theme for his successful 1960 presidential campaign. The term stuck around after Kennedy became president and continued to be used not only by NASA and its astronauts, but also by the media to promote such things as tennis shoes, record albums, and television shows.

The cover design of the next edition, which came out three years later, shows the Moon, Mars, and another planet (perhaps Venus?) orbiting the Earth with a stylized human figure standing nearby. Unlike the first cover, this edition presents recognizable objects within the solar system. By showing these objects and their relative proximity to the Earth, it suggests that they are all within NASA’s reach as the space agency began to more clearly define its role in the exploration of the New Frontier and man’s place in it. Conspicuously absent however are the pulp-like artwork depictions of space travel, now replaced by photos showing real hardware designed to convey a message of confidence and maturity in what NASA was doing.

In the third edition that came out in 1963, NASA evolved from using simple spot color on its cover to a more expensive four-color printing that showcases a brilliant telescopic image of the Orion Nebula. The 1964 edition features this same cover photo but with the addition of a white silhouette of the Apollo spacecraft moving left to right across the bottom. The intent was clear—by including the spacecraft that would take men to the surface of the Moon and back, NASA hinted that the lunar landing was just the beginning and that travel to the stars was also within its reach. The last issue, which came out in 1966, features a cover showcasing a Saturn V on the launch pad. This image conveyed to the reader that NASA was ready to go to the Moon, even though the rocket depicted was the Saturn V Test Article (SA-500F), an engineering mockup that was never designed for actual spaceflight. The first actual test flight of the Saturn V would not occur until November of the following year with the launch of Apollo 4.

Kapell argues that national space rhetoric, particularly that dealing with the frontier, had been part of NASA’s institutional culture and its public face since the beginning of its formation (Kapell

2015). He points out that Congressional Hearings in 1960 accepted that “we yield to the urge to explore that is an American heritage” (NASA 1960, p. 159). This is an interesting example of American exceptionalism—the idea that we conquered North America and so are a conquering type of people and somehow different from others like those in the Soviet Union, which does not have a similar history (ignoring Canada, Brazil, and other New World nations). By 1965, Kapell concludes, “NASA had fully accepted the mythic frontier underpinnings of their overall project, proclaiming that its missions were ‘exploration in the truest and most romantic sense’ and that space was, therefore, ‘the most recent of these ‘last’ frontiers’ of such exploration” (NASA 1965, p. 2). In talking about America’s adventures in space, NASA had to walk a fine line. The astronauts could say what they liked, but they were always under the watchful eye of their NASA keepers. Those in authority had to be more circumspect to avoid coming across as religious zealots on course to the stars via a crusade. “With its hint of the discoveries of fundamental truths concerning man, the earth, the solar system, and the universe,” noted a 1958 government document, “space exploration has an appeal to deep insights within man which transcend his earthbound concerns” (Coffman and Sampson 1991, pp. 845–63).

By no means was the American civil space program a bastion of secularism, but neither was it a Christian stronghold. Oliver observed that “the space program, for all of the Christians in its midst, for all of its evocations of transcendence, was a product primarily of profane, sometimes prosaic, ambition. For the most part, indeed, it serves as an object study in differentiation: religious values and symbols often did make the commute from suburban altar to NASA space center, but they were usually weakened by the journey, to the point where they exerted no autonomous authority over the substance and direction of space policy” (Oliver 2013, p. 43). Oliver’s observation is not entirely true, however, as one of NASA’s longest serving administrators demonstrated that one’s religious upbringing can bear an influence on how America would explore the New Frontier of space.

James Chipman Fletcher was the eldest of five sons and one daughter that was born of pioneering Mormon stock. He and his siblings all obtained academic degrees with four of the boys, including James, earning Ph.D. degrees in science. After obtaining a B.A. in physics from Columbia University in 1940, Fletcher worked in the war effort, using his physics background in various research capacities including a fellowship at Princeton. Soon after the War ended, he completed a Ph.D. in physics at Caltech.

Demonstrating an exceptional blend of both management and technical skills, Fletcher worked for various aircraft companies, including Hughes Aircraft in Los Angeles and the Ramo-Woolridge Corporation, where he worked on ICBMs. His unique abilities to both manage and do new research in the burgeoning aerospace field eventually led him to form his own company.

Fletcher’s success in business allowed him to return to academia, where he became the president of the University of Utah in 1964. During his business career and all the while University President, Fletcher continued serving in various government capacities that included both NASA and its predecessor, the National Advisory Committee for Aeronautics (NACA). In 1967, Fletcher was appointed by Lyndon B. Johnson to serve on the President’s Science Advisory Committee (PSAC), a committee that he had consulted since 1958 when it was first organized.

In the wake of the monumental successes of the Apollo Program, President Nixon sought someone who would lead NASA with a less costly vision as the agency struggled to define itself in the wake of the post-Apollo period. Administrator Thomas Paine, who lead NASA after Jim Webb left just prior to the Apollo 8 mission in 1968, was reluctant to slow the “go fever” that drove NASA to achieve Kennedy’s lunar landing goal. Now that the Apollo Program was over, Paine presented plans for NASA to a skeptical Nixon that included building a space station and sending humans to Mars. Nixon demurred and Paine soon stepped down. After Paine left NASA, he was replaced by Fletcher, who was sworn in by Nixon on 27 April 1971, and served as the head of NASA until 1 May 1977. After the Challenger accident, President Reagan asked Fletcher to return to help reorganize the agency. Fletcher stepped down from civil service on 8 April 1989.

During his lengthy tenure at NASA, Fletcher got caught up in America's national space rhetoric, even alluding to his Mormon ancestors: "History teaches that the process of pushing back frontiers on Earth begins with exploration and discovery is followed by permanent settlements and economic development. Space will be no different . . . Americans have always moved toward new frontiers because we are, above all, a nation of pioneers with an insatiable urge to know the unknown. Space is no exception to that pioneering spirit" (Fletcher 1987).

Fletcher was quick to seize on religious allegory that blended his Mormon ideals with the goals of NASA and the New Frontier of space. Mormon cosmology embraces not only the possibility of other worlds, but also the fact that they might be inhabited by intelligent life. The story of the Mormon faith is steeped in pioneer mythology and fits nicely into the broader Christian view of manifest destiny. Reeling from the murder of Joseph Smith, their founder and prophet, the Latter Day Saints (also known as the Mormons) supported a new leader named Brigham Young. In 1844, Young led the Mormons on a westward trek through some 1300 miles of mountain wilderness—a rite of passage they saw as necessary by God in order to find their promised land, a new Israel in North America. They settled into the Great Salt Lake Valley of what would eventually become the state of Utah. In the succeeding decades, wagon trains bearing thousands of Mormons followed Young's original westward passage on a path known as the Mormon Trail. The story behind the Mormon faith inspired Fletcher, who drew parallels between Abram leaving Ur and settling in Haran and the desire of mankind to push back frontiers, openly thinking that a "God-given desire will likely result in the colonization of space and a manned voyage to Mars by the end of the century" (Church News 1986).

Perhaps Fletcher's single biggest legacy to America's space program was in helping assure that NASA survived. As NASA struggled to define its role in the wake of the Apollo Program, the agency's very existence hinged upon a controversial decision in 1972 to build the Space Shuttle. Fletcher argued that the Space Shuttle was necessary to continue opening up the New Frontier of space. Even after President Nixon supported the decision to build it, Fletcher continued to make use of the pioneering Mormon allegory, as it remained an effective tool during the post-Apollo period. In comments he made in 1974, Fletcher noted that "the covered wagon and the railroads were not just transportation systems of their day, they helped earlier generations of Americans open a continent. In similar fashion, the Space Shuttle will open the new realm of near-Earth space for all mankind." He concluded that, "there is no new frontier in space for America and for mankind without the Shuttle" (Fletcher 1974, p. 42). Spaceflight historian and Mormon scholar Roger Launius, in writing about James Fletcher, notes that the long-serving NASA Administrator, in spite of his open religious views, was an effective leader of the agency, because he sincerely "believed that science and technology possessed the possibility of resolving most of the world's problems if they were used properly by a powerful, benevolent government" (Launius 1995, p. 238).

5. Print Media and the New Frontier

In 1936, America was introduced to *Life*, America's first modern picture magazine. Founded by Henry Robinson Luce, the unique format relied on large oversize photos and minimal text. A staunch anti-Communist, W.A. Swanberg called Luce "the world's most powerful unacknowledged political propagandist" (Swanberg 1972, p. 141). Luce saw America's entry into the New Frontier of space as the ultimate adventure story in which he could offer the perfect forum for its telling. *Life* was one of the best-selling and most influential news sources in America (Prendergast and Colvin 1986). The popularity of the magazine did not go unnoticed by the Kennedy administration. David Halberstam wrote that Kennedy viewed *Life* as a "key to the independent center". The President saw the magazine during the pre-television era as "the most influential instrument in the country" (Halberstam 1977, pp. 352–53).

Walter Bonney, NASA's first public affairs chief, approached *Life* with the idea of offering them an exclusive contract that would tell the astronauts' story to eliminate the distraction caused by the astronauts seeking to compete with different publications for the most lucrative deal. NASA liked the

idea, because it helped them control the coverage. The astronauts liked it because it was lucrative. *Life* met the minimum bid and won the contract in August of 1959 (Wainwright 1986, p. 261), a contract that would be renegotiated over subsequent years to include not only NASA's first group of Mercury astronauts, but also others that were later selected to fly in the Gemini and Apollo programs. In total, the *Life* contracts with NASA lasted eleven years, paying out millions to the astronauts and their wives, sixty people total (including eight widows), before the contracts ended beginning with Apollo 12, the second lunar landing mission (Sherrod 1973, p. 24)". NASA saw the contract with *Life* as a perfect vehicle to help sell the nascent space program to the general public. Loudon Wainwright, who covered the Mercury Program and knew the astronauts well, wrote "as always, NASA needed public awareness and acceptance to keep its program going—and viewed favorably by Congress. *Life* was a superb vehicle for that" (Wainwright 1986, p. 263).

Life not only secured exclusive rights to the astronauts' stories, but it also acquired book rights. In 1961, *Life* subcontracted with Golden Press and published *The Astronauts: Pioneers in Space*. The book appeared in multiple formats, including one written by Don A. Schanche that featured 48-gummed stamps depicting colorful photos from the Mercury Program that readers could stick on its pages.

Heavily illustrated with photos, graphics, and illustrations, these popular books were aimed at young readers. Wainwright's book includes an opening chapter entitled "Seven Pioneers" and refers to space exploration as "an adventure more exciting and more far-reaching than anything man has done before" (Wainwright 1961, p. 9). The sticker edition of the book ends with a chapter entitled "The Space Frontier" that optimistically proclaims that "Project Mercury will lead man to other great challenges of the space frontier" (Schanche 1961, p. 48). These books show how the frontier narrative, along with patriotic journalism, served to help *Life* depict the space program as a frontier adventure that appealed to all ages, while painting a portrait of a positive idealized America that helped reinforce President Kennedy's New Frontier rhetoric.

During the post-war era, interest in science fiction grew, and inexpensive mass-produced paperbacks and pulp magazines emerged to meet the growing demand. Lines separating fiction from fact became less well defined as the New Frontier of space started to become a real place in popular culture. Nonfiction books began appearing that romanticized humanity's future in space, with many of them borrowing the look and feel of popular pulps that had relied upon the formulaic elements of the classical frontier story.

As a result of the growing aerospace industry, trade publications emerged to help fill a need in the emerging scientific and engineering culture. Existing trade publications such as *Aviation Week* adapted their original editorial content to meet the demand. In addition, new ones were created such as *Space World*, edited by writer and publisher Ray Palmer, who served as editor of *Amazing Stories*. In the October 1956 premiere issue of *Missiles and Rockets*, the publisher wrote: "This is the age of astronautics. This is the beginning of the unfolding of the era of space flight. This is to be the most revealing and the most fascinating age since man first inhabited the earth" (Parrish 1956, p. 5).

In *Another Science Fiction: Advertising the Space Race 1957–1962*, Prelinger notes that advertising art in trade journals sometimes reflected a certain religious imagery that was most distinctly Christian in tone. "Most of the ad work that I interpret in my book is recruitment materials, and initially it was very fanciful and colorful. It was the type of art taken right from the pulp pages where contractors thought that anything was possible", said Prelinger during an interview. "In studying the many trade publications containing this industrial art, my sense, and this is just a synthesis based upon my years of research, is that the artists largely had free rein," said Prelinger. "The companies wanted imagery that would step outside of anything an engineer could come up with and get people's attention and harness people's engagement and faith in a company. It was predominantly . . . still is, but not as much, a Christian country at the time, and so I would guess that religious overtones reflecting that would appear in the artist's work" (Prelinger 2020). These images also convey the idea that we are being helped and guided so that success is inevitable.

One advertisement (see Figure 2) by Northrop used to promote its advanced engineering abilities loosely appropriates Michelangelo’s Sistine Chapel masterwork to illustrate its focus on the precision alignment needed to achieve space rendezvous (1960). The gesture of reach, while calling to mind the disembodied hands of Jesus surrounded by heavenly clouds, is shown in another advertisement (see Figure 3a) that features the US Air Force’s Bomarc missile (1959).



Figure 2. A 1960 advertisement used by Northrop to promote its advanced engineering appropriates Michelangelo’s Sistine Chapel to illustrate the precision needed to achieve rendezvous in space, a requirement that helped America put a man on the Moon. *Missiles and Rockets*, 23 May 1960.

In the March 1943 issue (Vol. 21, No. 3) of *National Aeronautics*, the official publication of the National Aeronautic Association, there appears an advertisement for Wright Aircraft Engines. The advertisement shows a Lockheed Constellation flying overhead across the desert, while a caravan of horses and covered wagons follows below (see Figure 3b). The plane is encapsulated in a large pendulum clock that conveys the passage of time. The advertisement begins with the question “What cost per ton mile”, followed by “Pioneers Camped Here June 3d 47. Making 15 miles today—all well,” wrote Brigham Young on an ox skull as the Mormon wagon train toiled its arduous way across America. That was costly transportation—costly in lives, labor, and time.” The advertisement continues with “Fifteen miles—one day, is now three minutes of flight. Each increase in the size, speed, and efficiency of transport planes reduces still more the cost of tonnage shipments by air.” The advertisement is an attempt to capture the hard slog of the various Mormon handcart expeditions, which were painfully slow and often deadly (Mormons did not use covered wagons). Wright Aircraft Engines may have been targeting Mormons for recruitment. “There was a mid-century push in intelligence to recruit Mormons on the assumption that because of their sobriety and family-centered nature they were ‘safer bets’. In addition to this, there is a strong tradition of Mormon hard science that goes back to the mid century” (Bialecki 2020).



(a)



(b)

Figure 3. (a) The advertisement on the left depicts a gesture of reach calling to mind disembodied spiritual hands surrounded by heavenly clouds is shown in an advertisement for the US Air Force’s Bomarc missile. *Missiles and Rockets* 20 July 1959. (b) The advertisement on the right shows how the aerospace industry has reduced the amount of time it takes to move tonnage by comparing the speed of twentieth-century aircraft, shown encapsulated inside a clock’s pendulum to denote time, to the movement of a nineteenth-century wagon train toiling westward along the Mormon Trail. *National Aeronautics* March 1943 Vol. 21 No. 3.

Neil Jacobs, who worked at McDonnell Douglas as an artist, explained that everything they did was directed by an art director and that artists had very little discretion in regards to the content of their compositions. They were also very busy, with many expected to complete 1–2 finished works a day (Jacobs 2020). As to the implied religious imagery, some argue that it is not present. “The scenes involving enormous hands might just as easily be attributed to human hubris: that is, those images may represent the hands of Mankind rather than God”, said space artist Ron Miller (Miller 2020).

Whether you interpret what you see in some of these ads as intentional religious imagery or not, it is worth noting that Robert McCall, one of the more famous space artists better known for his promotional artwork for Stanley Kubrick’s film *2001: A Space Odyssey* (1968) and as a production illustrator for *Star Trek: The Motion Picture* (1979), was a deeply religious man, and many of his works contain deliberate Christian symbolism, including pieces done as part of the NASA Art Program.

6. Other Media and the New Frontier

Over time, historians have distanced themselves from Frederick Jackson Turner’s thesis, arguing that it is too ethnocentric and nationalistic in its portrayal of the frontier as the locus of all American history and culture. Nevertheless, the myth of the western frontier still holds a powerful grip on American consciousness, as evidenced by the many books, movies, and television shows about the

West that became wildly popular in the twentieth century. “The frontier”, Turner explains, “is the line of most rapid and effective Americanization” (Turner 1998).

By the middle of the twentieth century, many Americans searched for a New Frontier, and some found it through television while watching a brand new science fiction series called *Star Trek* (see Figure 1). The civil unrest of the 1950s and 60s helped instill a belief in many Americans that space was not just a source for aliens bent on subjugating Earth’s populace, but a place that could be populated by average folks who warp through space aboard the starship *Enterprise*, a faster-than-light spacecraft as big as an aircraft carrier and filled with a crew comprised not only of humans but other races from our galaxy.

Created by Gene Roddenberry, a former World War II bomber and commercial airline pilot from Texas who moved to Los Angeles after the War, the idea for *Star Trek* came while he worked as a police officer by day and a writer for television by night, where he wrote mainly police stories and westerns. Eventually, studios gave him a shot at producing his own television shows.

Though initially not a big fan of science fiction, Roddenberry was caught up in the enthusiasm generated by President Kennedy’s New Frontier campaign. He recognized that the time might be right for a serious science fiction show that would address some of the social problems that otherwise might be too sensitive to tackle if portrayed in other television genres.

In 1964, Roddenberry began filming *Star Trek*’s first pilot “The Cage”. When shown to network executives, they thought that it would be “too cerebral” for mainstream viewers. However, they were willing to give the young television producer another chance, so they ordered a second pilot. This proved to be the charm, and *Star Trek* premiered on NBC on Thursday nights beginning 8 September 1966.

Each week, the show’s introductory monologue began with the voice of Captain James T. Kirk (William Shatner) announcing “space . . . the final frontier”, inviting viewers to join the crew of the starship *Enterprise* where they witnessed Roddenberry’s vision of life in the 23rd century. Through *Star Trek*, Roddenberry sought to invoke the same frontier nostalgia that was seen in the many Westerns that competed for television viewers every week. Like the American frontier that allowed a belief in rugged individualism that would lead to a better life during the nineteenth century, *Star Trek* allowed Americans to believe that the New Frontier of space represented a better tomorrow. This optimism was one of the key factors in the show’s popularity, in addition to its ability to maintain a Western theme by reinventing the frontier spirit to celebrate the space cowboy that so appealed to western democracies.

In addition to television, the inspired optimism of the Space Age and the emerging interest and excitement from exploring the New Frontier of space influenced music as well. After the Second World War, examples of “science-fictional” or “space age pop” music began to emerge. This type of music varied in style, rhythm, and arrangement, but shared a common similarity characterized by generous uses of string orchestra (or simulated strings) combined with a Latin American Music percussion section. The keyboard, both traditional and later electronic, is also frequently used, as well as the theremin, which produces an eerie off-world sound that became the trademark of many early science fiction movie soundtracks.

Collectively, these “sounds” of the New Frontier offered a forum that served to revive the mythical images of those who conquered the Western frontier. Tunes used by wagon teams who traveled west along the Oregon Trail to a new life served as inspiration for songs that would inspire a new generation of explorers wishing to travel into space. One of the best examples of this is Walter Schumann’s 1955 concept album, *Exploring the Unknown*. In this album, Schumann teamed with fellow composer Leith Stevens, who wrote music for such notable science fiction classics as *Destination Moon* (1950), *When Worlds Collide* (1951), and *The War of the Worlds* (1953). In *Exploring the Unknown*, Schumann and Stevens combine their talents to create a space-pop fantasia that rockets listeners through a celestial voyage. Beginning with a rocket launch from the Pacific, listeners travel beyond the Moon to arrive at Venus, where they encounter aliens. From here, they travel out into the universe before returning safely back to Earth, all the while accompanied by a background of heavy orchestration, celestial vocals, and a steady narration by veteran voice actor Paul Frees (Schumann 1955a).

Launched just a few years before Sputnik in 1955, *Exploring the Unknown's* New Frontier theme is very much apparent throughout the album. Its first song, entitled *New Frontiers* (Schumann 1955b), is a march that conjures up images of America's ancestors sailing west across the Atlantic. Even though the song is meant to invoke the New Frontier of space, it is hard not to picture brave pioneers crossing the Atlantic in a "sea of mystery" to "blaze a trail through the long light years" in an effort to meet any "wonders face to face" that "challenges the human race" to conquer the land of the New World to make "the universe one". This pioneering is sanctioned by God in the album's final song *Look Up* (Schumann 1955c). Here, the song's lyrics explain how the bold pioneers of this New Frontier of space have faith in what they are doing "beyond the fading Sun" as there is "Light enough that's bright enough" to keep their "faith" in "the hand divine" that is "commanding all" to remind "us just how small we are". Humility along, with divine affirmation that what you are doing is God's will, all make for a successful frontier narrative. The album conveys a very powerful message that the New Frontier of outer space is the frontier of America and is ready for the taking with God at their back (Schumann 1955a). The message of this album reaffirms what Newell describes as "the sense of chosenness by God that antedated the exceptionalism of the nineteenth century and could now be subsumed into the space boosterism of the twentieth century as a kind of revitalization of an American brand of utopianism and as a powerful belief in the efficacy of progress" (Newell 2019, pp. 228–9).

With the launch of Sputnik, the number of record albums of this type increased. However, the bulk of them were traditional LPs containing collections of songs composed with a Space Age theme. *Exploring the Unknown* was a concept album, so why was it produced and what was its intended audience? One possible answer might be found in Walt Disney and *Collier's* Magazine.

To help promote Disney's new theme park and its five original themed "lands" of Adventureland, Frontierland, Fantasyland, Main Street USA, and Tomorrowland, Walt Disney premiered "Disneyland", a network television show that first aired on CBS in 1955, the same year the park opened. Shows tied to the themes of Disney's theme park were presented each week and introduced by Walt Disney himself. To help promote Tomorrowland, Disney created a three-part series about space. The first episode, entitled *Man in Space*, premiered on 9 March 1955. This was followed later that year with *Man and the Moon* and finally *Mars and Beyond* that showed in 1957. These three films helped introduce Americans to the idea of the New Frontier of outer space. Episodes included guest appearances by such rocket scientists as Willy Ley, Heinz Haber, and Wernher von Braun. *Exploring the Unknown* narrator Paul Frees, known as "The Man of a Thousand Voices", did work for Disney including *Man in Space* and *Mars and Beyond* (Reinehr and Swartz 2008, p. 104).

More than one hundred million Americans saw *Man in Space*, approximately 60 percent of the US population at that time (Ordway et al. 1992, p. 145). Praised by critics for their high quality production values, these Disney films preached the gospel of spaceflight to Americans, many of whom were already primed after reading the *Collier's* series on space. From 22 March 1952, to 30 April 1954, *Collier's* magazine published a series of eight articles that laid forth America's future in space. These were written by a panel of experts that included Wernher von Braun, Fred L. Whipple, Joseph Kaplan, Heinz Haber, and Willy Ley. The *Collier's* series gave a realistic blueprint for space exploration accompanied by breathtaking artwork done by Chesley Bonestell, Fred Freeman, and Rolf Klep.

With the 1952 *Collier's* series, followed three years later with the opening of Tomorrowland and the premiere of the three-part "Disneyland" television series on space, public perception toward spaceflight began to change. In late 1949, George Gallup conducted a poll asking the public what their envisioned expectations by the year 2000 would be for science and technology. Eighty-eight percent thought we would find a cure for cancer. Sixty-three percent thought we would have atomic trains and airplanes. Only fifteen percent thought man would land on the Moon. Less than six years later, that same Gallup poll resulted in thirty-eight percent thinking that space travel was possible by the end of the twentieth century (Neufeld 2008, p. 277). By 1955, there emerged a belief among the youth in America's households that human space travel was not only something that could be done in their

parent's lifetime, it was also becoming hip, and record albums like *Exploring the Unknown* fit right in with a public clamoring to learn more about the possibilities of the New Frontier of space.

7. Conclusions

The American space program emerged as a democratic challenge to the threat of communist supremacy in the arena of outer space, and by default, that response carried a religious tone as a counterpart to the Soviet Union and its official atheistic stance. As anthropologist Deana Weibel writes, "The United States is a country, then, that sees itself, at least in terms of its historical mythology, as following the dictates of God and being rewarded in these pursuits. Space exploration has been an area of particular American achievement and many within the space program, particularly during the Space Race, believed that God's blessing was what made American success in space possible" (Weibel 2020).

National space rhetoric has played an integral part in the narrative of human spaceflight in America. NASA, members of Congress, and presidents from John F. Kennedy to the current administration all have embraced its sustained ideology of exceptionalism and long-standing beliefs in progress of the New Frontier with its associated images of pioneering individualism and rugged free enterprise. Even though the political, social, economic, and cultural context for space exploration has changed since the last footprints were left on the Moon, administrations continue to use this same rhetoric to help sell their vision for space.

In 1986, President Reagan's National Commission on Space, which was appointed to develop long-term goals for US civilian space exploration, entitled its final report *Pioneering the Space Frontier*. In this report, it describes its "pioneering mission for 21st-century America: to lead the exploration and development of the space frontier" (National Commission on Space 1986, pp. 2–3). In its 90-day *Study on the Human Exploration Initiative*, NASA declared, "the imperative to explore is embedded in our history ... traditions, and national character", and space is "the frontier" to be explored (NASA 1989, pp. 1, 104).

This theme continued during the George H.W. Bush administration: "America's space program is what civilization needs ... America, with its tremendous resources, is uniquely qualified for leadership in space ... our success will be guaranteed by the American spirit—that same spirit that tamed the North American continent and built enduring democracy." The "prime objective" of the US space program is "to open the space frontier" (National Space Council 1990, p. 17). Still another space study group during this time stated that "space is the new frontier", where the United States would find "a future of peace, strength, and prosperity" (Synthesis Group 1991, pp. iv, 9, 14).

Under the George W. Bush Administration, NASA Administrator Michael Griffin said that the aim of space exploration is "to make the expansion and development of the space frontier an integral part of what it is that human societies do" (Billings 2007, p. 494). Griffin has said, "it is in the nature of humans to find, to define, to explore and to push back the frontier. And in our time, the frontier is space and will be for a very long time ... The nations that are preeminent in their time are those nations that dominate the frontiers of their time. The failed societies are the ones that pull back from the frontier. I want our society, America, [W]estern society to be preeminent in the world of the future and I want us not be a failed society. And the way to do that, universally so, is to push the frontier" (Harwood 2006).

In a video designed to recruit volunteers to join the newest branch of the US military, the Space Force makes use of extensive language and imagery that are heavily influenced by ideas of the frontier-crossing and religious destiny. Using scenes of a contemplative young man standing along the seashore looking up to the heavens, the "Age of Exploration" is invoked, a time when Europeans traveled the globe in search of adventure, excitement, resources, and goods all the while spreading their influence while gaining strength and power under the guise of colonialism.

As the camera cuts to new recruits looking at a towering rocket before them, the video shows quick takes of an ethnic mix of Space Force members doing different jobs. As the video comes to a

close, the narration takes on a somewhat religious tone. “Maybe,” the voice suggests, “you weren’t put here just to ask the questions. Maybe you were put here to be the answer. Maybe your purpose on this planet isn’t on this planet.” Here, the listener is presented with philosophical or even metaphysical language. From the implication that you were “put” here suggests that there was something that did the putting. The terms “purpose”, “questions”, and “answer” all suggest a guiding authority: if you join the Space Force, you will find meaning in life (Weibel 2020). The last phrase suggests that the listener’s destiny might not be on this world, but off it. If you join the Space Force, you may not only travel into space, but perhaps even to another planet. Though not religious itself, this suggests that the Space Force cadets or whatever they are going to be called may help fulfill a special destiny, perhaps not only for themselves, but for whomever or whatever else they may find along the way.

The rhetorical usage of a higher power in this promotional video reflects a general ascendancy of religious conservatives in the political sphere and their desire to connect with this voting group—particularly the Republican Party. When John F. Kennedy was elected president in 1960, there was concern that he and his administration would be a Vatican tool, because he was a Catholic. Over half a century since that time, the dynamics of religion in American politics have changed. Religious conservatives have taken on a greater ascendancy in US politics.

Kevin Cole and David Domke analyzed presidents’ Inaugural and State of the Union addresses, beginning with Franklin Roosevelt in 1933. What they were looking for was the presence of “God talk” and any emphasis on freedom and liberty, two principles of great importance to religious conservatives. What they found is that the Reagan presidency was a watershed moment for American presidential religious discourse. “Beginning with Reagan, presidents have employed more God talk and have more frequently emphasized freedom and liberty in their State of the Union and Inaugural addresses than have previous modern presidents” (Cole and Domke 2006, p. 317). Cole and Domke point out that whereas their Cold War counterparts placed similar emphasis on freedom and liberty, Reagan and Bush had a “greater propensity to claim that a divine being has a special connection with freedom and liberty, and their much greater likelihood to speak declaratively about God’s wishes for these principles” (Cole and Domke 2006, p. 323).

Even though the Cole and Domke study concludes with president George W. Bush, the contemporary political climate of today reveals that a religious and political nexus is still present even in the New Frontier rhetoric of space. Vice President Pence during the Trump administration has generated attention, not so much for supporting the US space program, but in how he goes about doing it. Marina Koren has written about Pence’s frequent use of religious language when talking about space, particularly the Space Force. She writes that, “when Pence speaks of space exploration, he speaks not only of the frontier, but of faith. His speeches sometimes sound more like sermons,” and cites a statement Pence made at the very first meeting of the National Space Council in 2017: “As President Trump has said, in his words, “It is America’s destiny to be the leader amongst nations on our adventure into the great unknown. And today we begin the latest chapter of that adventure. But as we embark, let us have faith. Faith that, as the Old Book teaches us, that if we rise to the heavens, He will be there” (Koren 2018).

Since the end of the Cold War, New Frontier rhetoric has continued to dominate official and public discourse among space advocacy groups. Patricia Nelson Limerick notes that space advocates especially embrace the New Frontier metaphor, because they conceive “American history [as] a straight line, a vector of inevitability and manifest destiny linking the westward expansion of Anglo-Americans directly to the exploration and colonization of space” (Limerick 1994, p. 13). William E. Burrows describes how the space advocate community heavily promotes spaceflight, because “at the heart of it all, as usual, [are] the core dreamers . . . who steadfastly believed it was their race’s manifest destiny to leave Earth for both adventure and survival” (Burrows 1998, p. 507).

According to Linda Billings, the metaphor of the New Frontier with all of its associated images of manifest destiny, great courage, steadfast resolve, Puritan work ethic, and pioneering spirit looms large in a belief system that is still perpetuated by Americans whose ideology rests on a number

of assumptions about the role the US has played in the global community. Billings asserts that the rhetoric of frontier conquest and exploitation and its accompanying ideology that the US must remain “number one” by playing the role of political, economic, scientific, technological, and moral leader may be appealing to a certain demographic, but it is not one that is globally shared (Billings 2015, p. 12). Other nations, such as the Japanese Aerospace Exploration Agency with its “explore to realize” slogan, have taken a more pragmatic approach in formulating their plans for space that are less ideological.

Perhaps it is time to reexamine our nation’s space rhetoric whose words may no longer have the same meaning they once did at the height of the Cold War. Jacques Blamont, the founding director of the French Space Agency CNES, argues that people are losing interest in the human exploration of space “because spacefaring nations, and especially the USA, have clung to outmoded cold war ways of thinking about it. The US attitude of ‘command’ over its international partners will no longer work” (Billings 2015, p. 12).

Here on Earth, manifest destiny originated as an explicitly religious concept, so it does not take a leap of faith to see how that same religiosity was carried forward into the New Frontier of space. The idea that a human future in space is written in the stars is compelling. “For many involved in the American project of human space settlement, a belief in destiny is a powerful source of motivation that often shapes and is shaped by religious ideas, and, even in the absence of explicit beliefs, inspires a secular sort of faith,” writes Deana Weibel, a professor of anthropology and religious studies at GVSU who has interviewed numerous scientists, astronauts, and workers in the space field. She found that “a sense of destiny—religious or otherwise—provides many contemporary space workers, from astronauts and astronomers to engineers and aerospace physicians, with the moods and motivations humanity will need if we are ever to become a multi-planet species” (Weibel 2019).

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Article

Reexamining the “Separation of Church and Space”: Evangelical Protestant Support for Space Exploration in the Trump–Pence Age

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Abstract: President Donald Trump began his presidency in January 2017 by exclaiming, “We stand at the birth of a new millennium, ready to unlock the mysteries of space . . . ” His “Make America Great Again” agenda has included a reinvigorated space policy—spearheaded by the creation of the Space Force military branch and NASA’s *Launch America* in partnership with the private sector. Prior to this administration, a 2015 study by Ambrosius found that Evangelical Protestants are the least supportive of space exploration when compared with other religious traditions and the public. These findings emerged from the analysis of several national surveys conducted between 2009 and 2011. This present study uses similar methods to revisit these findings in light of Evangelicals’ robust political support for the president and Vice President Mike Pence, the chair of the National Space Council who frequently evokes religious imagery in space-related speeches. Analysis of the General Social Survey conducted between 2004 and 2018 reveals that Trump’s presidency may have modestly altered this wall of separation. Evangelicals in 2018 remain significantly lower than non-Evangelicals in space knowledge, interest, and policy support, but they exhibit greater increases than the non-Evangelical population in space interest and support over levels during the Obama and Bush presidencies.

Keywords: space exploration; space policy; Evangelical Protestantism; religion and politics; President Donald Trump; Vice President Mike Pence; Space Force; General Social Survey

“No challenge can match the heart and fight and spirit of America. We will not fail. Our country will thrive and prosper again. We stand at the birth of a new millennium, ready to unlock the mysteries of space, to free the Earth from the miseries of disease and to harness the energies, industries and technologies of tomorrow. A new national pride will stir ourselves, lift our sights and heal our divisions.”

—President Donald Trump’s inaugural address, 20 January 2017 (Malik 2017)

1. Introduction: Space and Religion in the Trump Age

Evangelical Protestants express lower levels of support for space exploration than the population as a whole and other religious traditions (Ambrosius 2015, 2016). Ambrosius (2015) referred to this observation as the “separation of church and space.” Interestingly, and perhaps paradoxically, the Trump–Pence administration has emphasized both the priorities of religious conservatives (including Evangelical Protestants) and the promise of space exploration.

President Donald Trump followed the precedent of Presidents Johnson, Nixon, and Reagan by bringing space exploration into his inaugural address at the dawn of his presidency (Malik 2017). Within the first year of his administration, President Trump signed (1) an executive order on 30 June 2017 re-establishing the National Space Council, which previously ended in 1993, and (2) Space Policy Directive-1 on 11 December 2017 with plans to revisit the Moon and eventually Mars in partnership

with the private sector. At the signing of the latter, Vice President Pence firmly placed space exploration within the President's "Make America Great Again" agenda when he said, "Under President Trump's leadership, America will lead in space once again on all fronts. As the President has said, space is the 'next great American frontier'—and it is our duty—and our destiny—to settle that frontier with American leadership, courage, and values" (Wang 2017).

In March 2018, President Trump first spoke about the need to create an independent space force in a speech to the Miramar Marine Corps Air Station in San Diego, California: "Space is a war-fighting domain just like the land, air, and sea . . . We have the Air Force, we'll have the space force" (Koren 2018b). In traditional Trump style, he added off the cuff remarks taking credit for the idea: "I was saying it the other day—cause we're doing a tremendous amount of work in space—I said, maybe we need a new force. We'll call it the space force. And I was not really serious. And then I said, what a great idea. Maybe we'll have to do that. That could happen. That could be the big, breaking story" (Koren 2018b). In reality, these comments furthered a previous 2017 proposal by Representatives Jim Cooper (D—Tenn.) and Mike Rogers (R—Ala.) to create a Space Corps within the Department of the Air Force, which passed in the U.S. House of Representatives but failed during negotiations with the U.S. Senate. Speaking to the National Space Council in June 2018, President Trump gave orders to the U.S. Department of Defense to establish the Space Force as a new branch of the Armed Forces, despite alternating calls for the Force to remain within the Air Force. The 2020 National Defense Authorization Act would eventually create an independent Space Force when signed by President Trump in December 2019.

Vice President Pence, who as chair of the reconstituted National Space Council became the space spokesperson for the administration, has explicitly linked faith and space by using religious imagery when speaking to various space constituencies (Koren 2018a). For example, Pence concluded his remarks with the following words at the 34th Space Symposium in Colorado Springs, Colorado, in April 2018:

And as we renew our commitment to lead, let's go with confidence and let's go with faith—the faith that we do not go alone. For as millions of Americans have believed throughout the long and storied history of this nation of pioneers, I believe, as well, there is nowhere we can go from His spirit; that if we rise on the wings of the dawn, settle on the far side of the sea, even if we go up to the heavens, even there His hand will guide us, and His right hand will hold us fast. It's an honor to be with you today. I leave here today with renewed confidence that with your support, with the efforts of the National Space Council, with the hard work of all who labor across the nation to forge America's future in space, with the strong leadership of President Donald Trump, the courage of a new generation of explorers, and with God's help, I know America will once again astonish the world with the heights that we reach and the wonders we achieve, and we will lead the world into space once again. Thank you. God bless you. And God bless the United States of America. (Pence 2018a)

This rhetoric is not an isolated incident—Pence has included similar religious references in speeches to the National Space Council and at the Pentagon ((Pence 2017, 2018b), respectively). It is unclear if these spiritual allusions are simply a product of Pence's faith-based public persona or if they are a strategic effort to unite church and space for more hesitant believers (Coppins 2018; Koren 2018a). The audience has generally consisted of space professionals, but aspects of the remarks may be covered by the news media to achieve broader reception.

Evangelical Protestants have been steadfast supporters of the Trump–Pence candidacy and presidency—with estimates that some four-fifths of Evangelical voters supported the ticket in the 2016 election (Martínez and Smith 2016). There are, however, Evangelical critics of President Trump. *Christianity Today* (CT), a publication founded by evangelist Billy Graham to "help evangelical Christians interpret the news in a manner that reflects their faith," called for the President's removal from office during impeachment proceedings and labelled him as "morally lost and confused" (Galli 2019). CT has nevertheless stood by Vice President Pence—even citing, approvingly, comments by Southern Baptist

leader Richard Land that Pence “is the 24-karat-gold model of what we want in an evangelical politician” (Coppins 2018; Silliman 2020). In the lead-up to the 2020 Vice Presidential Debate, CT published a list of Pence’s major contributions to the administration’s policy goals, which included his support of space exploration: “In addition to his passion for religious conservative causes, one of Pence’s main policy focuses has been the heavens. The vice president has ‘taken the lead on rebuilding the nation’s space program’ . . . ” (Silliman 2020).

In light of this context, this current research revisits Ambrosius’ (2015) conclusions by examining Evangelical support for space exploration in 2018—after at least one-year of solid support for various high-profile space initiatives by the Trump–Pence administration—in comparison to support during the two prior administrations. This study finds that Evangelicals remain significantly lower than non-Evangelicals in space knowledge, interest, and policy support, as they were during the Bush and Obama administrations. Support for space exploration, measured by the proportions of the population who are “very interested” and support maintaining or increasing space funding, has steadily grown over the three presidential administrations of the 21st century. Thus, it is not entirely surprising to note that Evangelicals have also increased in space interest and support, but Evangelicals do exhibit modestly greater increases than the broader population in the highest categories of interest and support over the levels observed during the Obama era. A regression analysis shows that Evangelicals’ significant net gain in funding support during the Trump administration holds even when socio-demographic and political controls are added. The paper concludes by cautioning against inferring too much from these indirect findings and exploring implications for future work at the crossroads of religion and space opinions.

2. Theoretical Framework: Evangelical Protestantism and U.S. Politics/Policy

While this paper is a study of the public opinion of space exploration, this literature review instead emphasizes theoretical explanations of why and how Evangelical identity might matter for space attitudes. For reviews of literature on the broader determinants of space opinions, see for examples: Launius (2003); Nadeau (2013); Roy et al. (2000); Whitman Cobb (2011, 2020).

2.1. Religion and Politics Theory

Why might one expect that Evangelical Protestants have distinct views of space exploration? Evangelical Protestantism is one of the major religious traditions in America—alongside other Christian traditions (Mainline Protestantism, Black Protestantism, Anglo Catholicism, and Latino Catholicism) and non-Christian traditions (Judaism, Islam, Hinduism, etc.). Scholars of religion and politics in the U.S. identified political divisions *between* different religious traditions, such as Catholics and Protestants (religious differences confounded by different ethnicities and national origins), since the early twentieth century. This Durkheimian approach emphasizing religious *belonging* has been termed the *ethnoreligious theory* (Smidt et al. 2009b).

More contemporary scholarship has argued that differences over traditional (conservative) and modern (liberal/progressive) religious beliefs have divided followers *within* religious traditions and united traditionalists and modernists with their respective counterparts in other traditions. From this perspective, it is religious *beliefs* that matter politically rather than primarily the religious groups to which people belong—as conservative/liberal theology feeds into conservative/liberal political ideology. This approach has been labelled the *religious restructuring* or *culture war* thesis following Wuthnow (1988) and Hunter (1991), respectively (Smidt et al. 2009a). During recent electoral controversies concerning the culture war and “values voters,” researchers uncovered a *God gap* existing between those voters who attend church more frequently and those who do not—thus emphasizing a third measure of religious *behavior* (Smidt et al. 2010). Worship attendance is a public religious behavior, while prayer or Bible reading are private behaviors. Taken together, many scholars of the religious causes of public opinion emphasize the potential impacts of all “3Bs,” religious *belonging, believing,*

and *behaving*, which has been labelled—perhaps incorrectly—by others as the *religious commitment* approach (Djupe and Calfano 2014; Smidt 2019; Smidt et al. 2009a).

An alternative theory, called the *social networking* approach, argues that while other scholarship may find effects of the 3Bs on political opinions and behaviors, this perspective tells us nothing about the mechanisms by which preferences are conveyed to parishioners (Djupe and Calfano 2014). Scholars must instead find ways to control message exposure, perhaps through experimental means, and then measure adoption of beliefs. Messages can be conveyed to religious publics across several domains: via clergy in churches, other religious leaders outside churches, and politicians or other political elites/opinion leaders (Djupe and Calfano 2014). Messages may or may not be adopted by individual believers. Some types of messages—such as those employing covert “God talk” or displaying a basis in prayer and scripture reading—might be more effective at shaping some religionists’ views.

Another contemporary approach argues for a return to religious belonging—that religious organizations exert institutional effects on their memberships that shape participants’ preferences. Ambrosius (2011) terms this approach *polity replication* because it argues that those who identify with churches employing decentralized congregational polity (e.g., Baptists and many other Evangelicals) prefer decentralization in society, while members of churches with centralized/hierarchical episcopal polity (e.g., Catholics) conversely prefer more centralization in society.

Researchers might expect that Evangelicals will differ from other traditions on a variety of policy areas, potentially including large-scale, expensive activities of government like space exploration. Religious and political beliefs as well as religious behaviors might also matter—and could be the forces responsible for any Evangelical differences from the general population or other traditions.

2.2. Religion and Space Attitudes

How might Evangelical Protestantism exert an effect on space attitudes? All of the discussed operationalizations of religion could potentially impact space policy views and represent various explanations for any Evangelical differences on space. Tradition, along with an individual church’s organizational structure and the messages its ministers convey, adopted beliefs, and religiously-motivated behaviors, all must be explored as possible avenues for religious influence. Most statistical analyses of public opinion related to space disregard religious predictors (e.g., (Whitman Cobb 2020)). Nadeau (2013) is an exception—the multivariate models do include a measure of church attendance, but not as an expression of religious behavior but as a theorized facet of ideology alongside partisanship and political orientation. This variable was not a statistically significant predictor of space policy funding in Nadeau’s models—and thus, gave the impression that religion does not matter for space policy attitudes (or at least not for space funding preferences).

Ambrosius (2015) was the first comprehensive study of how various conceptions of religion could shape various dimensions of space attitudes.¹ This study explored the impact of the 3Bs on antecedents of space policy support (space knowledge and interest), space policy support (support for space funding), recognition of space benefits, and expectations of future space accomplishments. Ambrosius found that Evangelical Protestants were the one religious tradition that consistently stood out in its differences with other traditions and with the broader population—in the negative direction. Furthermore, traditional religious beliefs and behaviors, including more frequent church attendance and more literal views of scriptures and origins, were also negatively associated with support for

¹ Ambrosius (2015) was labeled by another article in the journal *Space Policy* as “an exemplary model of quantitative analysis” that “serves as a good model for future quantitative space policy studies because the analysis is theoretically motivated, the methods and data are appropriate to the questions at hand, and the study’s implications are clearly discussed with reference to theory and policy” (Pomeroy 2019, p. 16).

space.² Note that the results show *lower* levels of Evangelical support for space activities overall, not across-the-board *opposition* to space exploration by members of the tradition.

Ambrosius (2015) also includes a measure capturing the social networking approach in the models of space support. Specifically, a model of one's recognition of space benefits to society (space exploration does "more good than harm," versus "more harm than good") finds increased odds of agreement with a positive assessment of space exploration's effects *if* one's clergy member speaks positively about science, controlling for other factors. This finding demonstrates that messages about topics related to policy from religious leaders—in this case, positive views of science in general—can impact the policy views of parishioners. Ambrosius does not assess Djupe and Calfano's (2014) other possible sources of message exposure—including exposure to religious messages from political leaders such as Vice President Pence. This present study attempts to measure the effect of the Trump–Pence administration's messaging on Evangelical Protestants' space attitudes, albeit indirectly. While the religious commitment approach to religion and politics has demonstrated utility when applying it to space exploration, so has the newer social networking approach. The latter represents a promising method for further studying the mechanisms by which religious believers' space policy attitudes are formed—in indirect (this study) or, when possible, direct methods.

3. Research Questions and Hypotheses

Past research was motivated by the broad question: how does religion, variously defined, affect attitudes toward space and space policy in the general public, if at all? Ambrosius (2015, p. 20) specifically asks, among other questions, "Do religious traditions differ from the broader public in their space knowledge, interest, policy support, and expectations? In particular, how do Evangelicals differ from society's views and the views of other traditions' members?" The answer to those questions, given the findings of Ambrosius' analysis of 2009–2011 General Social Survey and Pew Research Center data, is that Evangelical Protestants rank significantly lower across the board on nearly all measures of support for space exploration—when compared with the general public and other religious traditions. This present study extends the previous work by asking two empirical questions:

- (Q1) Do Evangelical Protestants continue to rank below non-Evangelicals in space knowledge, interest, and support for space funding following the narrow cross-section of time analyzed by Ambrosius?
- (Q2) Do Evangelical Protestants in the Trump age express greater space knowledge, interest, or support than Evangelicals during previous presidential administrations?

The corresponding hypotheses under study are:

- (H1) Evangelical Protestants continue to rank below non-Evangelicals in space knowledge, interest, and support for space funding during the latter years of the Obama presidency and the beginning period of the Trump presidency.
- (H2) Evangelical Protestants in the Trump age express greater space knowledge, interest, and support than Evangelicals during the Bush (43) and Obama eras.

4. Data and Methods

The hypotheses are tested using data from the publically available, cumulative General Social Survey (GSS) data file. The GSS is a biennial representative survey of US adults over the age of 18. The analysis is limited to iterations of the survey collected during the George W. Bush,

² Some commentators misunderstood the meaning of "negative" effects. For example, *Answers in Genesis* (the operator of the Creation Museum) astronomer Dr. Danny Faulkner (2014) wrote that, "This report at least implies that these once-respected practices and beliefs [church attendance and high view of scripture] are harmful to society. While not as hostile as the attitudes of Richard Dawkins and Bill Nye, it is condescending." Ambrosius' (2015) findings claim an inverse relationship between variables, not a negative effect on society.

Barack Obama, and Donald Trump presidencies.³ Due to the operational definition of Evangelical Protestantism—defined as Protestants who have had a born-again experience (to maintain consistency with Ambrosius (2015) and Pew methods)—the analysis is further restricted to the 2004–2018 GSS years (omitting 2002 for the Bush presidency).⁴ The variable *reborn* is included consistently since 2004 on each iteration of the GSS, but was previously included in 1988, 1991, and 1998 only. The survey years under analysis align with recent presidencies as follows: Bush (2004–2008), Obama (2010–2016), and Trump (2018). All years between 2004 and 2018 are analyzed together, which requires that all independent and dependent variables be recoded if measurement differences exist between collection years.⁵

Table 1 describes the sample size and Evangelical Protestant proportions for the GSS conducted between 2004 and 2018. While the presence of born-again Protestants has generally increased over time, levelling out around 30% every year after 2008, the level among all respondents (N = 21,121) over this period is just over one-quarter (1.8 percentage points lower if non-white born-again Protestants are excluded). This prevalence signifies that this tradition is a powerful force in American society and politics—offering significant electoral backing to the Republican Party (Martínez and Smith 2016).

Table 1. Total General Social Survey (GSS) Sample Sizes and Evangelical Protestant Proportions, 2004–2018.

Year	Total N	Evangelical N	Evangelical %	Presidency
2004	2814	362	12.9%	Bush
2006	4512	892	19.8%	Bush
2008	2023	623	30.8%	Bush
2010	2044	598	29.3%	Obama
2012	1975	615	31.1%	Obama
2014	2538	764	30.1%	Obama
2016	2867	906	31.6%	Obama
2018	2348	721	30.7%	Trump
TOTAL	21,121	5481	26.0%	

NOTES: Evangelical Protestant tradition recoded from *relig* (Protestant) and *reborn* (Yes: “Would you say you have been ‘born again’ or have had a ‘born again’ experience—that is, a turning point in your life when you committed yourself to Christ?”). Tradition identified by born again experience, rather than denomination of congregation, to maintain continuity with previous study and Pew Research Center methods. 2002 omitted from Bush era surveys because *reborn* was not included consistently until 2004. GSS weight WTSS applied.

Ambrosius (2015) analyzes the GSS and several Pew Research Center surveys administered around the same time. While several Pew surveys administered during the Trump administration are available and include religion *and* space variables, the decision was made to limit this present analysis to three core space measures included in the GSS. Pew surveys ask about space exploration regularly, but often vary in type of measure and question wording. The GSS is more consistent over time, allowing a direct comparison between years and, in this case, presidential administrations.

Table 2 identifies and describes the three GSS space measures under analysis: space knowledge (which sums three science knowledge questions related to basic space science, but not space exploration

³ President Bush drew significant support from Evangelicals but did not directly connect his space policy goals to religion as much as Vice President Pence. For example: one prominent space speech delivered at NASA headquarters included the phrase “god willing” (quoting astronaut Eugene Cernan) and referred to outer space as the “heavens,” but did not develop the connection further (Bush 2004). Evangelical support during the Bush administration is included in this paper to serve as a baseline and to broaden the scope of the analysis.

⁴ The GSS is weighted using the weight WTSS, which takes into consideration the sub-sampling of non-respondents and the number of adults per household. Because only GSS iterations since 2004 are included in this analysis, the weight WTSS is the same as if the weight WTSSALL were applied.

⁵ The only variable included in this study that was measured differently during these years is income. There are three income measures used across the survey years: *income98*, *income06*, and *income16*. These were combined into a single variable with 11 consistent categories. The highest category begins at the 1998 amount.

or policy in particular); space interest (a three-point ordinal scale of interest with “very interested” as the highest category); and space policy support (support for funding space exploration or the space exploration program, operationalized in three categories with “too little” as the highest category). See Appendix A for exact question wording and the recoding syntax for all GSS space variables under analysis. (Questions for other religious, socio-demographic, and political variables are not included, but can be found in the GSS codebook.) The two GSS measures of space funding (*natspac*, *natspacy*) are combined into a single variable despite modestly different question wording for the higher level analysis (see Appendix B for support for this strategy).

Table 2. Space Exploration Variables in the General Social Survey (GSS), 2004–2018.

Name	Years Available	Original Variable(s)	Questions	Range
Space Knowledge	2006–2018	<i>bigbang</i>	The universe began with a huge explosion. Is that true or false?	0–1
		<i>earthsun</i>	Now, does the Earth go around the Sun, or does the Sun go around the Earth?	0–1
		<i>solarrev</i>	How long does it take for the Earth to go around the Sun: one day, one month, or one year?	0–1
			-Score correct out of three	0–3
Space Interest	2008–2018	<i>intspace</i>	Issues about space exploration: are you very interested (3), moderately interested (2), or not at all interested (1)?	1–3
Space Policy Support	2004–2018	<i>natspac</i> , <i>natspacy</i>	[The] space exploration [program]: are we spending too much (1), too little (3), or about the right amount (2) on [the] space exploration [program]?	1–3
			-Dummy variable: right amount + too little	0–1

NOTES: Ranges as indicated have all been recoded from the original variables so that higher scores denote greater space knowledge, interest, and support.

Question 1 is first assessed by an analysis of Evangelical and non-Evangelical means for all space-related dependent variables and *t*-tests for significant differences between group means during each presidency (Table 3). Question 2 is then evaluated by a comparison of proportions of Evangelicals and non-Evangelicals within the highest categories of space interest and support during each administration and the change between administrations (Tables 4 and 5).

Table 3. Space Exploration Variable Means for Non-Evangelical Protestant and Evangelical Protestant Respondants with Significance Level of Differences, GSS 2004–2018.

Variable (range)	Bush			Obama			Trump		
	Non-Evang., 04–08	Evang., 04–08	Sig. level	Non-Evang., 10–16	Evang., 10–16	Sig. level	Non-Evang., 18	Evang., 18	Sig. level
Space knowledge (0–3)	1.71	1.32	0.001	1.64	1.29	0.001	1.47	1.20	0.001
<i>intspace</i> (1–3)	1.90	1.84	NS	1.97	1.78	0.001	2.00	1.82	0.001
<i>natspac</i> (1–3)	1.80	1.66	0.001	1.96	1.80	0.001	2.00	1.89	0.05
<i>natspacy</i> (1–3)	1.78	1.65	0.001	1.95	1.79	0.001	2.05	1.81	0.001
<i>natspacy</i> combined (1–3)	1.79	1.66	0.001	1.96	1.80	0.001	2.03	1.85	0.001

NOTES: Space knowledge sums three GSS variables: *bigbang*, *earthsun*, and *solarrev*. Bush era variables are measured from 2004–2008 with the exceptions of *intspace* (2008 only) and the space knowledge score (2006–2008). GSS weight WTSS applied. NS = not significant.

Question 2 is also analyzed by split Binary Logistic Regression Models of Evangelical and non-Evangelical funding support from 2004 to 2018 (Table 6). The dependent variable is a binary measure: a score of “1” denotes belief that funding for space exploration is “too little” or “just [the] right amount” (versus a score of “0” for “too much”). Whitman Cobb (2011) refers to this combined category as an “issue public” for space exploration. The key independent variable is a dummy for 2018 respondents—which will show whether Evangelicals in the Trump era are significantly different in space support from Bush or Obama era counterparts, and whether this difference in support differs

from that of non-Evangelicals. Following Ambrosius (2015) and other studies of space attitudes, the models include controls for socio-demographics and other characteristics. Control variables include sex (male dummy), race (black dummy), ethnicity (Hispanic dummy), birth cohort (before or after baby boomers generation from 1946 to 1965), education, income, political ideology (conservatism scale), political party (Republican and independent dummies), and church attendance (religious behavior scale). To simplify analysis, this study does not consider specific religious beliefs. While Ambrosius (2015) included a measure of region (South dummy—not significant in any models), this study omits region due to Whitman Cobb’s (2020) findings that southern residents are not any more supportive (maybe less so) of space spending than other regions despite the concentration of space facilities in the South. An additional specification for each sample adds in the antecedents of support, space science knowledge and space interest, as independent variables to explore any changes to the findings and whether a 2018 effect remains.

Table 4. Percentages of GSS Respondents Across Categories of Space Interest - Full Sample vs. Evangelicals, 2008–2018.

Categories (<i>inspace</i>)	Bush		Obama		Trump	
	Full Sample, 08	Evang., 08	Full Sample, 10–16	Evang., 10–16	Full Sample, 18	Evang., 18
Very interested	22.4%	20.0%	25.9%	15.6%	27.9%	20.2%
Change from previous:	–	–	+3.5	–4.4	+2.0	+4.6
Moderately interested	44.8%	44.3%	45.4%	46.4%	44.4%	41.5%
Change from previous:	–	–	+0.6	+1.9	–1.0	–4.9
Not at all interested	32.8%	35.7%	28.7%	38.0%	27.7%	38.3%
Change from previous:	–	–	–4.1	+2.3	–1.0	+0.3

NOTES: The variable *inspace* is only available for 2008 during the Bush presidency. GSS weight WTSS applied.

Table 5. Percentages of GSS Respondents Across Categories of Space Policy Support – Full Sample vs. Evangelicals, 2004–2018.

Categories (<i>natspacy</i> variables combined)	Bush		Obama		Trump	
	Full Sample, 04–08	Evang., 04–08	Full Sample, 10–16	Evang., 10–16	Full Sample, 18	Evang., 18
Increase funding (“too little”)	15.7%	10.7%	24.4%	17.5%	26.3%	17.2%
Maintain funding (“just right amount”)	47.5%	44.4%	47.0%	44.5%	50.3%	50.9%
Increase/Maintain combined	63.2%	55.1%	71.4%	62.0%	76.6%	68.1%
Change from previous:	–	–	+8.2	+6.9	+5.2	+6.1
Less funding (“too much”)	36.8%	44.9%	28.6%	38.0%	23.4%	31.9%

NOTE: GSS weight WTSS applied.

Table 6. Split Binary Logistic Regression Models (BLRM) of Support for Maintaining/Increasing Space Funding Among Evangelical and Non-Evangelical Respondents, GSS 2004–2018.

Variables	Model 1 <i>Evangelicals</i>	Model 2 <i>Evangelicals</i>	Model 3 <i>Non–Evang.</i>	Model 4 <i>Non–Evang.</i>
2018/Trump era (<i>year</i> recode, 0–1 dummy)	0.334 ** (0.103)	0.358 * (0.158)	0.455 *** (0.073)	0.301 ** (0.112)
Male (<i>sex</i> recoded, 0–1 dummy)	0.299 *** (0.066)	–0.071 (0.118)	0.195 *** (0.046)	–0.260 ** (0.083)
Black (<i>race</i> recoded, 0–1 dummy)	–0.312 *** (0.088)	0.025 (0.161)	–0.821 *** (0.076)	–0.659 *** (0.135)
Hispanic (<i>hispanic</i> recoded, 0–1 dummy)	–0.311 * (0.121)	–0.282 (0.202)	–0.320 *** (0.063)	–0.045 (0.112)
Pre–1946 birth (<i>age</i> recoded, 0–1 dummy)	0.224 * (0.097)	0.148 (0.161)	–0.095 (0.070)	–0.125 (0.122)
Post–1965 birth (<i>age</i> recoded, 0–1 dummy)	0.296 *** (0.072)	0.253 † (0.129)	0.196 *** (0.051)	0.115 (0.089)

Table 6. Cont.

Variables	Model 1 <i>Evangelicals</i>	Model 2 <i>Evangelicals</i>	Model 3 <i>Non-Evang.</i>	Model 4 <i>Non-Evang.</i>
<i>Education (degree, 0–4)</i>	0.238 *** (0.032)	0.171 ** (0.057)	0.237*** (0.022)	0.211 *** (0.039)
<i>Income (income98/06/16 recoded, 1–8)</i>	0.060 *** (0.017)	0.066 * (0.029)	0.037 ** (0.011)	0.052 ** (0.020)
<i>Conservatism (polviews recoded, 1–5)</i>	0.023 (0.040)	0.070 (0.074)	−0.046 ‡ (0.028)	−0.032 (0.049)
<i>Republican (partyid recoded, 0–1)</i>	0.285 ** (0.099)	0.427 * (0.175)	0.281 *** (0.071)	0.427 ** (0.128)
<i>Independent (partyid recoded, 0–1)</i>	0.094 (0.086)	0.063 (0.152)	0.035 (0.053)	−0.067 (0.091)
<i>Church attendance (attend recoded, 1–6)</i>	−0.081 *** (0.020)	−0.061 ‡ (0.035)	−0.017 (0.014)	−0.021 (0.024)
<i>Space interest (intspace recode, 1–3)</i>	–	1.280 *** (0.091)	–	1.230 *** (0.060)
<i>Space knowledge (summative score, 0–3)</i>	–	0.115 ‡ (0.062)	–	0.027 (0.042)
<i>Intercept</i>	−0.528 ** (0.178)	−2.938 *** (0.369)	0.050 (0.119)	−2.123 *** (0.235)
<i>N</i>	4444	1758	10,030	3805
<i>χ²</i>	264.713 ***	339.200 ***	549.887 ***	738.074 ***
<i>(degrees of freedom)</i>	(12)	(14)	(12)	(14)
<i>Nagelkerke Pseudo R²</i>	0.081	0.253	0.076	0.250

NOTES: Models 2 and 4 are restricted to GSS years 2008–2018 due to the availability of *intspace* and the space knowledge questions. A score of “1” on the dependent variable denotes belief that funding for space exploration is “too little” or “just [the] right amount” (versus a score of “0” for “too much”). Original GSS variable names and ranges in parentheses after each independent variable description. Binary logit coefficients with standard errors in parentheses. Omitted reference categories for nominal independent variables: 2004–2016 (pre-Trump), female, non-black, not Hispanic, baby boomer (date of birth between 1946 and 1964), and Democrat. GSS weight WTSS applied. Significance levels: ‡ 0.10; * 0.05; ** 0.01; *** 0.001. Significant coefficients in bold.

5. Results

5.1. Evangelical Protestant Support for Space Exploration Compared with Non-Evangelical Support

A difference of means test finds that Evangelicals are significantly less knowledgeable, less interested, and less supportive of space spending than others when all samples are combined for 2004–2018 GSS surveys (not shown). Table 3 breaks this finding down by three subsets of GSS years divided between the three presidencies of Bush, Obama, and Trump. All Evangelical means are significantly different than non-Evangelical means for all variables and all periods with the one exception of space interest during the Bush administration. Every Evangelical mean is numerically lower than the non-Evangelical mean for every variable and period. This finding holds if non-white Evangelicals are excluded from the Evangelical tradition (not shown).

5.2. Evangelical Protestant Support for Space Exploration during the Trump Presidency Compared with Evangelical Support Prior to the Trump Presidency

The means contained in Table 3 can also be used to examine Question 2. Over time, space knowledge has decreased for Evangelicals and non-Evangelicals alike, while space interest and funding support are on upward trajectories for both categories. Deeper analysis of the responses will allow a better evaluation of Evangelical trends in comparison with broader trends.

Table 4 compares the categories of space interest across the three administrations for the full GSS sample and for Evangelicals specifically. Again, the proportions for Evangelicals are lower in the supportive categories. When compared to the broader population, Evangelicals in 2018 are 7.7 points below all respondents in the “very interested” category and 2.9 points lower in the “moderately interested” category. Alternatively, Evangelicals have a 10-point advantage in the “not at all interested”

group. While this disinterested contingent has remained constant at 38% for both the Obama and Trump eras, there has been some change during the Trump presidency in the other two categories. Notably, the “very interested” group increased by nearly five points, drawn from the “moderately interested” camp. The highest level of interest also increased society-wide, but only by two points. In other terms, the proportion that is “very interested” went up by about 30% for Evangelicals but only 8% for everyone.

If support is instead measured by the percent of “very” and “moderately” interested combined (vs. “not at all” interested), then Evangelical interest is flat at around 62% over the two presidencies. On the whole, GSS respondents increased by one point in this combined measure to just over 72%.

Table 5 replicates this proportional comparison for the space funding categories. This data summary again supports the general increase in space policy support over the three 21st century presidencies. The division between those who want to increase/maintain funding versus those who want to decrease funding has evolved favorably, in the direction of support, from Bush to Trump: 63–37, 71–29, and now 77–23. This trend is also evident for Evangelicals: 55–45, 62–38, and 68–32. Evangelicals consistently lag behind, but have steadily become more supportive of space spending.

Nonetheless, the percentage of Evangelicals favoring increased funding has remained flat at just over 17% under Obama and Trump. The percentage of Evangelicals favoring current funding levels instead increased by over six points. When combined, the proportion of Evangelicals in [Whitman Cobb’s \(2011\)](#) “issue public” for space exploration increased by 6.1 points in 2018, over the 2010–2016 level, compared with a 5.2-point increase for everyone. Conversely, the rate of Evangelicals in the camp favoring funding cuts decreased by a corresponding 6.1 points. Evangelicals are 36% more likely to be represented in this least supportive category in 2018 when compared with the full population.

Table 6 extends this analysis of support for funding by constructing Binary Logistic Regression Models (BLRM) of funding support for Evangelicals and non-Evangelicals, estimated separately, using all respondent data from 2004 to 2018. The dependent variable is 1/0—1 if the respondent favors increasing or maintaining space funding and 0 if the respondent favors decreasing space funding. The key independent variable is a dummy of whether the case is a 2018 GSS respondent during the Trump presidency. The base models (1 and 3) feature socio-demographic, political, and religious control variables to assess whether any net significant effect of the 2018 dummy remains. Models 2 and 4 additionally add space interest and space science knowledge to the right-hand side of the equation.

All models exhibit significant Chi-Square statistics (0.001 level). The Evangelical and non-Evangelical models are equally matched at predicting the outcome of support for increasing/maintaining spending—given the equivalent Pseudo R-squares of 0.08 (models 1 and 3) and 0.25 (models 2 and 4). Most predictors’ effects on the odds are the same in direction and significance with a few differences between the models in each matched set (1/3, 2/4).

As hypothesized, the effect of the 2018 Trump era dummy variable is positive and significant across all Evangelical models—even when other potentially important factors are controlled for in the model. However, it is also positive and significant across all non-Evangelical models, which also control for other factors. Thus, a potential Trump–Pence effect is not limited to the target religious tradition but is, rather, documented society-wide. The effect is greater in the non-Evangelical Model 3 than in Evangelical Model 1, but lower in the more-developed non-Evangelical Model 4 than in the more-developed Evangelical Model 2. Thus, when controlling for other factors including the antecedents of space policy opinions, the effect of the 2018 dummy variable on the odds of support is greater for Evangelicals than non-Evangelicals.

The coefficients of a logistic regression such as BLRM are more difficult to interpret than the coefficients of linear regression because they are in log-odds units. These logit coefficients can be converted to probabilities to make them more understandable. Given that the emphasis of this current analysis is the effect of the 2018 variable, probabilities are calculated twice for each category of Evangelicals and non-Evangelicals by inserting, alternatively, a 1 or 0 value for this variable into the regression equation. All other variables are held at their mean value (calculated separately for

each group for the same cases included in the regression model following listwise deletion of cases). Coefficients are taken from Models 2 and 4. The calculated probability that an Evangelical prior to 2018 (2004–2016) supported the same or more space funding is 0.636, whereas the probability for Evangelicals in 2018 is 0.714—an increase of nearly eight points or 12.31%. Alternatively, the probability that a non-Evangelical supported the same or more space funding is 0.729 prior to 2018 (2004–2016) and 0.784 in 2018—an increase of 5.5 points or 7.57%. These probabilities are all well above 0.5, denoting that a majority of Evangelicals do support space exploration despite the tradition as a whole consistently demonstrating lower levels of support than non-Evangelicals, other traditions, and society.

While not the focus of this study, the directions on the various control variables are interesting. The male effect is generally positive, but becomes negative (and no longer significant for Evangelicals) when space interest and knowledge are accounted for in the model. Because non-white, born again Protestants were maintained in the Evangelical tradition (versus being relegated to ethnic categories as some analysts recommend; see (Smidt et al. 2009b)), a negative effect emerges for black and Hispanic respondents. These statistically significant effects are negated in the Evangelical model when space interest and knowledge are added. However, the non-Evangelical Model 4 maintains a diminished but sizable significant effect for black respondents. The generational controls suggest that baby boomers have lower odds of supporting space, but the findings become less clear when interest and knowledge are added. Education and income are positive and significant across the board in all models. Standardized coefficients (betas) calculated from a Linear Probability Model (LPM; not shown) show that education exerts twice the effect of income and is the second strongest predictor in the models. When it comes to politics, ideology and party independence do not seem to matter across the board. Identification with the Republican Party, however, has a consistent significant, positive influence on support—and the GOP effect is strengthened when interest and knowledge are added to the models. Church attendance is a negative predictor for Evangelicals, but is not significant in the non-Evangelical models. Finally, space interest greatly enhances the predictive power of Models 2 and 4 (tripling the pseudo R-square) and exerting the strongest effect on the odds (LPM beta for interest is the strongest at 0.36 for both models)—while greatly decreasing the analytical sample because interest and the knowledge questions are asked of subsets of respondents. The space knowledge score is positive but not significant at a conventional 0.05 level for either subgroup.

6. Discussion and Implications

The Trump administration, through the words of space spokesperson Vice President Pence, used religious language to sell the purpose of space exploration throughout 2017–2018 (Koren 2018a). This study attempts to evaluate whether or not this rhetoric, and the overall prominent place of space exploration on the administration's agenda, has elicited greater support for space among some of Trump–Pence's greatest allies—Evangelical Protestants. Past research has found that Evangelicals are the least supportive of space exploration among the prominent religious traditions in the U.S. (Ambrosius 2015). While it would be desirable to directly measure an impact of Pence's messages on Evangelicals, as the social networking approach to religion and politics would prefer, this study takes an indirect approach by looking for significant differences in Evangelical space attitudes after at least one year with Trump as commander-in-chief.

The evidence uncovered by this study, particularly the multivariate model, supports the claim that while the attentive public for space exploration among Evangelicals continues to lag behind non-Evangelicals (support for H1), Evangelicals in 2018 experienced greater gains over the rate of non-Evangelicals (possible support for H2, with the exception of space knowledge, which has declined). These findings may back the assertion that the Trump–Pence space initiatives and supportive religious rhetoric are producing results among Evangelicals; however, given the indirect measurement of any effects, we must be cautious in interpreting the findings. It is possible that the modest gains in support among Evangelicals are due to something not measured by this study at all. It is admittedly unlikely that Pence's faith-based language was publicized widely when excerpts were printed or cut

for use on cable news networks. Therefore, it is most likely that the modest gains in Evangelicals' support for space—relative to the slightly lower gains among non-Evangelicals—is attributable to support for space exploration by an allied administration rather than a result of specific speeches with religious references.

The across-the-board increases in space support by Evangelicals and non-Evangelicals are likely related to the general prominence of news reports about Space Corps/Force and private sector space actors (e.g., SpaceX, Blue Origin, and Virgin Galactic) and their charismatic leaders (e.g., Elon Musk, Jeff Bezos, and Richard Branson) during the early part of the Trump presidency. Framing space exploration as a *military* or *economic growth* issue (versus a *science* issue) and the shift to greater private sector implementation of space policy may be welcome developments to conservative Evangelicals, perhaps leading to greater interest and support (even if most private activity is still funded by government). The drop in basic space science knowledge may be a product of growing distrust in science and experts. For Evangelicals and other religious conservatives, it is likely due to hesitance to endorse one of the scientific “facts” included in the quiz score—the big bang theory (which may or may not be seen as compatible with Evangelical views of universal and human origins).

Much has occurred between the collection of the 2018 GSS and the writing of this paper—including the official creation of the Space Force as the newest military branch and the May 2020 launch of American astronauts from American soil (*Launch America* in partnership with SpaceX) for the first time since the retirement of the space shuttles in 2011. Further research should use the 2020 GSS, once released, to gauge attitudes further into the Trump age. Additionally, researchers should find ways to improve upon these exploratory findings by directly measuring the impacts of religious rhetoric in service of space exploration.

Interestingly, Weibel (2020) identifies religious themes in the marketing campaign of Space Force. She quotes the May 2020 recruitment video as suggesting, “Maybe you weren’t put here just to ask the questions. Maybe you were put here to be the answer. Maybe your purpose on this planet isn’t on this planet.” Weibel connects “the idea that the listener was ‘put’ here” to the act of a “higher power,” and the use of the term “purpose” to Christianity’s emphasis on “God’s purpose” for humanity. She concludes by making hypotheses that could be investigated by future work similar to this present study:

Because of this [mistrust of science], making explicit connections between science and space exploration may be problematic at the current time. Associating space with the military is one way to downplay the scientific aspects. Military technology, for instance, is rarely seen as having a liberal bias. Another way to reduce this problematic association is to link space with religion. When we think about the early days of the American space program and the way that American religious practice was contrasted with the atheism of the Soviet Union, it is easy to see why tying religious language and imagery with the United States Space Force is the approach being taken in this recruitment video. New Space Force recruits aren’t being asked to be academic elites or rocket scientists, they’re being asked instead to fulfill a celestial destiny. (Weibel 2020)

Future research should directly test Weibel’s hypotheses to examine what types of arguments in favor of space exploration—scientific, religious/spiritual, military/defense, or something else—are most effective at encouraging support among the mass public and specific religious communities. Evangelicals in particular may be more receptive to religious language and also connections between space and strong national defense, as opposed to purely scientific justifications. After all, Vice President Pence’s space speeches did not only include spiritual allusions but also strong claims for a reinvigorated space policy in response to Chinese challenges to U.S. space and military hegemony (Pence 2018b).

Supplementary Materials: The General Social Survey cumulative data set (1972–2018) is available for download at: <https://gss.norc.umd.edu/get-the-data>. Syntax for recoding the space exploration variables is in Appendix A.

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Appendix A

This appendix contains the original question wording of the General Social Survey (GSS) questions related to space exploration. All other questions may be found in the GSS Codebook, which accompanies the online data set. Non-response coding and some transitional language between questions has been removed for brevity. SPSS syntax for recoding these variables is included below each question.

“I would like to talk with you about some things people think about today. We are faced with many problems in this country, none of which can be solved easily or inexpensively. I’m going to name some of these problems, and for each one I’d like you to tell me whether you think we’re spending too much money on it, too little money, or about the right amount.”

“The space exploration program: are we spending too much, too little, or about the right amount on the space exploration program?” (*natspac*)

OR

“Space exploration: are we spending too much, too little, or about the right amount on space exploration?” (*natspacy*)

- (1) Too much
- (2) Too little
- (3) About right

Recode *natspac* (1 = 3) (2 = 2) (3 = 1) (0 = SYSMIS) (8 = SYSMIS) (9 = SYSMIS) into *natspac2*.

Variable labels *natspac2* ‘Support for spending on the space exploration program’.

Value labels *natspac2* 1 ‘spending too much’ 2 ‘spending just right amount’ 3 ‘spending too little’.

Recode *natspacy* (1 = 3) (2 = 2) (3 = 1) (0 = SYSMIS) (8 = SYSMIS) (9 = SYSMIS) into *natspacy2*.

Variable labels *natspacy2* ‘Support for spending on space exploration’.

Value labels *natspacy2* 1 ‘spending too much’ 2 ‘spending just right amount’ 3 ‘spending too little’.

Compute *natspac_y2* = *natspac2*.

Variable labels *natspac_y2* ‘Combined variable on support for space exploration/...program’.

Value labels *natspac_y2* 1 ‘spending too much’ 2 ‘spending just right amount’ 3 ‘spending too little’.

IF (*natspacy2* = 1) *natspac_y2* = 1.

IF (*natspacy2* = 2) *natspac_y2* = 2.

IF (*natspacy2* = 3) *natspac_y2* = 3.

Recode *natspac_y2* (1 = 0) (2 = 1) (3 = 1) into *sameORMore*.

Variable labels *sameORMore* ‘Spending same OR spending more dummy variable’.

Value labels *sameORMore* 1 ‘Spend same/more’ 0 ‘Spend less’.

EXECUTE.

“There are a lot of issues in the news, and it is hard to keep up with every area. I’m going to read you a short list of issues, and for each one—as I read it—I would like you to tell me if you are very interested, moderately interested, or not at all interested.”

“Issues about space exploration: are you very interested, moderately interested, or not at all interested?” (*intspace*)

- (1) Very interested
- (2) Moderately interested
- (3) Not at all interested

Recode intspace (1 = 3) (2 = 2) (3 = 1) (8 = SYSMIS) (9 = SYSMIS) into intspace2.

Variable labels intspace2 'Interest in space exploration'.

Value labels intspace2 1 'not at all' 2 'moderately interested' 3 'very interested'.

EXECUTE.

"The universe began with a huge explosion. Is that true or false?" (*bigbang*)

- (1) True
- (2) False

"Now, does the Earth go around the Sun, or does the Sun go around the Earth?" (*earthsun*)

- (1) Earth around sun
- (2) Sun around earth

"How long does it take for the Earth to go around the Sun: one day, one month, or one year?" (*solarrev*)

- (1) One day
- (2) One month
- (3) One year

Recode bigbang (1 = 1) (0 = SYSMIS) (2 = 0) (8 = 0) (9 = 0) into bigbang2.

Recode solarrev (3 = 1) (0 = SYSMIS) (1 = 0) (2 = 0) (4 = 0) (8 = 0) (9 = 0) into solarrev2.

Recode earthsun (1 = 1) (0 = SYSMIS) (2 = 0) (8 = 0) (9 = 0) into earthsun2.

Compute spaceknow = sum(bigbang2,solarrev2,earthsun2).

Variable labels spaceknow 'Scientific knowledge score of three space-related questions'.

Value labels spaceknow 1 '1 of 3 space questions correct' 2 '2 of 3 space questions correct' 3 '3 of 3 space questions correct'.

EXECUTE.

Appendix B

This appendix presents evidence to support the decision to combine together *natspac* and *natspacy* into a single variable to be used as a dependent variable in assessing the research questions. As described in Appendix A, the question wording differs slightly. The first, *natspac*, asks about spending on "the space exploration program." The second, *natspacy*, asks about spending on "space exploration" in a more general sense. The GSS includes two versions for a variety of spending questions to examine the impact of question wording. In this case, the subtle insertion of the bureaucratic term "program" may bias some respondents against expressing support.

For the full sample, combining all GSS respondents since 2004, the respective percentages responding to *natspac/natspacy* are as follows: too much (32.7/34.9), right amount (48.3/45.6), and too little (19.0/19.5). For some reason, when dropping "program," about 2% of respondents shift from right amount to too much—the opposite of the expected direction discussed above. For Evangelical respondents from 2004 onward, the same ~2% shift occurs: too much (38.6/40.7), right amount (46.1/44.3), and too little (15.2/14.9). Otherwise, the proportions are very similar for Evangelicals and non-Evangelicals alike.

About this overall difference, Whitman Cobb (2020) writes, “What is interesting is that space exploration as an ideal would seem to attract more people to it and yet the GSS responses show quite the opposite. Overall, more people were willing to spend more on space exploration program compared to space exploration.” Because Whitman Cobb studies differences between regions, and the frequencies of the response categories vary by region, she decides to analyze *natspac* and *natspacy* separately.

Given the slight difference in wording, a Chow test comparing regression coefficients indicates whether the two samples belong together or are in fact too different (Chow 1960). If respondents can be divided into two distinct samples, one can write:

$$y = X\beta_1 + \varepsilon;$$

$$y = X\beta_2 + \varepsilon,$$

where y is the dependent variable, X is a vector of independent variables, ε is the error term, and β_1 and β_2 are parameters to be estimated for each subsample. The null hypothesis to test is:

$$H_0: \beta_1 = \beta_2$$

The Chow test statistic is calculated as follows:

$$F = \frac{[ESS_c - (ESS_1 + ESS_2)]/k}{(ESS_1 + ESS_2)/(n - 2k)},$$

where F is the test statistic, ESS_c is the error (residual) sum of squares for the combined model, ESS_1 is the error sum of squares for the first subsample, ESS_2 is the error sum of squares for the second subsample, k is the number of estimated parameters, and n is the total sample size. The resulting test statistic is distributed $F(k, n - 2k)$.

If one rejects the null hypothesis of equal coefficients, then the two samples are distinct and cannot be combined. If one does not reject the null, the responses are similar enough to combine the sample into one for regression analysis predicting the combined variable. Because the Chow test works for linear and not logistic regression models, a multiple linear regression is estimated alternating between three dependent variables: *natspac*, *natspacy*, and the combined measure. The resulting F statistic for the full sample is 1.51(15, 5425) with a p-value of 0.0923. For the Evangelical subsample, F is 1.43 (15, 1616) with significance of 0.1251. Thus, these F statistics do not reach the critical value for a significance of 0.05. Because one cannot reject the null, responses are considered similar enough to be combined for regression analysis.

This Chow test application is not ideal in this situation, given the ordinal nature of the dependent variable used by the linear regression—and the binary recode of the dependent variable used for this paper’s logistic regression. Nonetheless, it does provide some quantitative evidence that these two variables with slight wording differences do “hang together” enough from 2004 to 2018 to be combined for analysis (when considering both the full sample and the Evangelical subsample).

Another way to look for question effects is to create a dummy variable for those asked the second version of the question (*natspacy*, which asked about “space exploration”) versus the original version (*natspac*, which asked about “the space exploration program”). This allows one to test for significant differences in the means for the two groups. The means of the two groups for the full sample (2004–2018) and for Evangelicals (same period) specifically, on the 3-point scale, are not significantly different. For all respondents, the means are 1.8634 (*natspac*) and 1.8467 (*natspacy*). The t -test significance is 0.115. For Evangelicals only, the means are 1.7663 (*natspac*) and 1.7419 (*natspacy*). The t -test significance is 0.216. In both cases, the null of mean differences cannot be rejected.

Given the similar distributions and the failure to reject the null in both the Chow (F) and difference of means (t) tests, the decision was made to combine these variables in parts of the analysis (see Table 3, Table 5, and Table 6). Table 3 does report findings for the two separate and one combined measure.

This decision will not apply to all studies of the GSS space spending questions outside of the time period and independent variables (Evangelicalism and the Trump era) analyzed here.

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Article

Incorporating Space: Protestant Fundamentalism and Astronomical Authorization

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Abstract: The problem of authority is vital for understanding the development of Protestant creationism. Two discursive fields have figured centrally in this religious movement's claims to authoritative knowledge: The Bible and science. The former has been remarkably stable over a century with a continuing emphasis on inerrancy and literalism, while the latter has been more mutable. Creationism's rejection of scientific evolution has endured, but its orientation to a range of scientific models, technologies, and disciplines has changed. Astronomy is a prime example; once relatively absent in creationist cultural production, it emerged as yet another arena where creationists seek to corrode scientific authority and bolster biblical fundamentalism. Drawing on archival documents of creationist publications and the ongoing media production of an influential creationist ministry based in Kentucky, this article illustrates how creationism has sought to incorporate astronomy into their orbit of religious authorization. Ultimately, the case of incorporating space helps clarify fundamentalism's machinations of power.

Keywords: creationism; astronomy; incorporation; power

1. Introduction

Based in northern Kentucky, the ministry Answers in Genesis (AiG) is one of the world's most active creationist organizations. Much like other influential fundamentalist Protestant institutions, AiG operates as an empire of cultural production (Harding 2000). They publish books and periodicals, coordinate a research journal, produce films and radio programs, curate an extensive online library of resources, design Christian homeschooling curricula, host summer Bible camps for kids, and organize group tours on Alaskan cruises and Grand Canyon hiking/rafting expeditions. The ministry's most recognizable personality, Ken Ham, travels extensively to speak at churches and conferences, maintains an active weblog, hosts a daily online radio program, regularly speaks with major news outlets as a representative voice for Christian conservatism, and communicates daily with his nearly 66,000 Twitter followers.

AiG's Creation Museum established itself as the ministry's epicenter when it opened in May 2007. During its first decade, the attraction averaged roughly 300,000 visitors annually, a number that increased when a companion theme park, Ark Encounter, opened nearby in July 2016 (Trollinger and Trollinger 2016). The 75,000-square foot facility is set on 47 acres, including a botanical garden, petting zoo, and series of zip lines. Altogether, the attraction immerses visitors into a creationist vision of the Bible, human and natural history, and conservative Christian theo-politics (e.g., from scriptural inerrancy to denial of anthropogenic climate change).¹

¹ I use the term "theo-politics" to mark creationist cultural production as always thoroughly engaged in both the theology of Protestant fundamentalism and the political interests of the Religious Right coalition.

When you enter the main building, you move through an opening portico, a 300-foot curving walkway that guides you to the ticket booth.² Two displays in the portico area represent something of the diverse interests that animate the creationist imagination. The more elaborate display, installed in 2012, is “Dragon Legends.” This choreographed series of murals and artifact replicas presents the creationist argument for why dragons recorded in folklore were actually dinosaurs, supporting a young Earth chronology and the earthly co-existence of humans and dinosaurs. The other display is a single object and not a replica. Positioned across from the ticket booth, the sign at its base reads:

Historic

Planetarium Projector

This Spitz A3P Star and Planet planetarium projector, built in 1956, was used to train NASA’s Mercury astronauts.

Project Mercury (1959–1963) was the United States’ first manned spaceflight program. In 1958, special training began for 110 military pilots. This group included Alan Shepard, Jr. (first American in space) and John Glenn, Jr. (first American to orbit the earth), two of the famed ‘Mercury 7.’

The projector was retired by the US military in the fall of 2000. Satellites, computers and GPS devices have eliminated the need for training in celestial navigation.

For many people, especially critics of creationism, something like “Dragon Legends” is expected. Public representations of the Creation Museum—expressed as both skeptic ridicule and creationist pride—frequently emphasize images of humans and dinosaurs interacting (Laurence 2019). The NASA artifact, however, may be more surprising. One question is how AiG came to possess this object, something we might expect to reside at a place like the National Air and Space Museum. Another question is broader and helps organize the analysis that follows here: what value does outer space have for creationist cultural production? I will explore an answer to this question, illustrating how creationists have sought to incorporate astronomy into their repertoire of strategies for claiming scientific legitimacy. Ultimately, creationists mobilize astronomy in their ongoing effort to wrest authority from mainstream science and bolster their own theo-political ambitions (cf. Barone 2019).

2. Creationist Astronomy

Every day, Answers in Genesis performs the work of religious publicity. I adopt this term from anthropologist Matthew Engelke (2013), who presents it as a critical reassessment of how to study religion in public life. “When we talk about ‘public religion’ today we are often actually talking about ‘religious publicity’” (xv). By this he means that the status of religion being public should not be taken for granted. Instead, “public” should be understood as a status that is actively imagined, pursued, established, circulated, and managed by socially positioned religious actors working toward particular strategic aims.

² This article is informed by an extended ethnographic project focused on the Answers in Genesis creative team who led the design of Ark Encounter (October 2011–June 2014) (cf. Bielo 2018). The participant observation focus of this fieldwork was on the everyday life of the team’s design studio, but also included public events organized by Answers in Genesis. In addition, between 2009 and 2020, I visited the Creation Museum (Petersburg, Kentucky) roughly 15 times, and also toured four other creation museums in California, Tennessee, Georgia, and Ohio. The primary data analyzed here are creationist astronomy writings published between 1981 and 2020, including articles from *Insight* (a monthly feature published by the Institute for Creation Research); *Acts & Facts* (a monthly periodical published by the Institute for Creation Research); and *Answers* (a quarterly periodical published by Answers in Genesis). The data corpus included three articles from *Insight*, drawn from 10 issues (1996–2015); 31 articles from *Acts & Facts*, drawn from 46 issues (2011–2015); and seven articles from *Answers*, drawn from 14 issues (2006–2017). The publications were collected by the author on visits to creation museums, received via free mail subscription, and purchased through eBay. The issues were reviewed for all creationist astronomy articles and were then analyzed using critical discourse analysis (Fairclough 1989). In addition to these print publications, numerous creationist astronomy articles and videos were drawn from the Answers in Genesis website, especially content produced by Danny Faulkner.

The religious publicity of Answers in Genesis is defined by several interlaced ambitions. First, they seek to educate the public about creationism. This is essentially about circulating creationist content grounded in the theological and political culture of Protestant fundamentalism. This basic ambition props up the twin goal of encouraging doubt about the veracity of evolutionary science and bolstering creationist claims to legitimacy. This double-edged strategy of “constructing and corroding” authority works in tandem with other creationist efforts, such as maneuvering to influence public school science curricula (Lincoln 1994). AiG also hopes to create alternative spaces of pedagogy, devotion, and religious entertainment, both brick-and-mortar and digital. The Creation Museum is a safe haven for committed creationists who are suspicious of evolutionary-based science and natural history museums.³ Finally, the religious publicity of the ministry is evangelistic. Through their cultural production, they hope that non-fundamentalists will experience spiritual conviction and a born-again conversion or rededication. Ultimately, Answers in Genesis’ religious publicity is designed with the structural ambition of culture change: irrespective of how many individuals might convert, they work to revise how the public orients toward creationism, constructing it as a legitimized modern identity.

As contemporary creationists jockey for cultural authority, a longstanding strategy has been the assertion of “creation science” as a viable alternative to evolutionary science (Numbers [1992] 2006). The modern creationist movement, of which Answers in Genesis has developed into an influential expression, traces to the 1961 publication of *The Genesis Flood: The Biblical Record and Its Scientific Implications*. The authors—a hydraulic engineer, Henry Morris, and a conservative biblical scholar, John Whitcomb—argued that natural science supports a strict biblical literalism that treats the Book of Genesis as an accurate documentation of early Earth and human history. Morris and Whitcomb’s treatise—later institutionalized through organizations like the Creation Research Society (1963), the Institute for Creation Research (1972), and Answers in Genesis (1994)—argued that all scientific inquiry is grounded in a philosophical worldview. In this ‘worldviews’ model creationists and non-creationists simply have different ‘starting points’ for practicing science. While biblical scripture is always the ultimate authority for creationists, the coining of “creation science” and its elevation as a movement strategy illustrates the cultural capital of science and the authority that is at stake in making this appeal for scientific legitimacy (Toumey 1996; cf. Huskinson 2020; Oberlin 2020).

The social temporality of creationism is centrally concerned with the changes wrought by scientific modernity, namely the embrace of evolutionary science in the late 19th century. In their account of history, trust in evolution sparked a social and moral freefall and an active rejection of biblical inerrancy. The Darwinian turn in the natural sciences marks something of a Second Fall for creationists, nearly as damning as expulsion from Eden. Part of the creationist diagnosis is that science needs redeeming, needs to be rescued from the control of ‘secularists’ and returned to the rightful domain of ‘Bible-believing Christians.’

One observation this article develops about creation science is that it is not a fixed field of practice, but one that creationists continually fashion in dialogue with professional scientific inquiry, popular culture, and social change. In *The Genesis Flood*, creation science focused primarily on geology and archaeology, an emphasis which dominated the early institutionalization of creation science. Still today, ministries like Answers in Genesis and the Institute for Creation Research produce a tremendous amount of content that revisits issues such as the rock layers of Arizona’s Grand Canyon and how the hominid fossil record should be interpreted. But, through the decades, creation science has also grown to encompass other fields, such as astronomy and genetics. Creation science is a core strategy in the broader creationist project of seeking public legitimacy and its capacity to expand is worth theorizing. To do so I turn to a dynamic process termed “incorporation.”

³ As Barone (2019) observes, Answers in Genesis also produces content designed to guide creationists through evolutionary science and natural history museums.

In her critical analysis of Oprah Winfrey—as celebrity, commodity, and brand—religious studies scholar Kathryn Lofton (2011) observes that Oprah’s charismatic authority is reproduced and expanded through a variety of mechanisms. A primary mechanism is for Oprah to draw diverse “experts” (Lofton 2011, p. 74) into her orbit of cultural production. While these individuals (e.g., Dr. Phil on mental health, Suze Orman on financial health, Dr. Oz on physical health) benefit with respect to their own celebrity by association with Oprah, it is Oprah who incorporates them into her empire. To incorporate is to stake a claim of rightful belonging. It is about bolstering the power of one source by instrumentalizing other sources. Rather than engaging select cultural fields as antagonists or competitors, incorporation is about defining those fields as resonant and coherent with one’s own production.

Incorporation is a useful concept because it highlights how power is expanded and intensified through drawing symbolically and materially potent actors into an otherwise distinct institutional field. In the case of creation science, creationists seek to incorporate scientific disciplines, findings, technologies, and debates into their existing theo-politics; never altering the claims of fundamentalism, rather always mobilized to argue for the already presumed truth of fundamentalism. Unlike Oprah, creationists do not have the cultural capital to incorporate mainstream science in any fully successful way. Theirs is always an attempted incorporation, denied by mainstream gatekeepers. But their attempts are unceasing, and their tenacious cultural production forces mainstream science into a difficult position: to ignore or to confront and refute.

Creationists’ attempted incorporation of astronomy follows a series of organizing cultural logics. The objects of astronomical science—planetary motions, lunar cycles, meteor paths, star formation, and so on—are said to ultimately testify to ‘God’s handiwork’ and it is the creation scientist who is uniquely positioned to interpret outer space correctly. This article’s analysis is based on roughly 40 examples of creationist astronomy written between 1980–2020, and across this corpus a shared argument predominates: ‘Secular astronomers fail to explain fundamental questions, such as the formation of the universe, and in response to their failure they concoct ever more elaborate theories, which are anti-scientific and reveal their desperation to conjure a world that was not created and is not ruled by a sovereign God.’ Through these writings, creationists perform a proprietary stance toward astronomy. As they do with dinosaurs, creationists construct the stuff of astronomy as properly theirs and in need of reclaiming from ‘evolutionists’ (Laurence 2019).

The special promise of astronomy, compared to geology or archaeology, is that it can reveal previously unknown truths about the universe. Again, tracking with established creationist logics, the emerging findings of astronomy are mobilized to reinforce what creationist have always claimed: we live in a world of natural order, the earth is far younger than evolutionary science claims, and the only viable explanation for the origins of life and matter is a creator God. Consider an illustrative example.

Answers is a quarterly periodical published by AiG, a glossy magazine with a mix of popular and technical writing, features marketed to different age groups, and ads for diverse creationist commodities (from homeschooling materials to conferences and university programs). Imagine being part of a creationist household: the newest issue arriving in your mail would offer something of interest for the whole family. The April–June 2012 issue included a three-page article entitled “New Discoveries of Order in the Sun.” The author, Jason Lisle, earned his doctorate in Astrophysics from the University of Colorado-Boulder and for several years worked for AiG as a staff astronomer. In the article’s opening, Lisle frames his discussion of new research about the sun’s physical properties with an enduring creationist trope:

We cannot see inside the sun. Thankfully, new tools and techniques are available. Astrophysicists can use these methods to probe beneath the solar surface. The closer

they look, the more structure they see. The marvelous design of this supersized energy factory points clearly to the wise Sustainer of life.⁴

Creationist astronomy also performs an enduring creationist discourse strategy. This strategy emerges from the conspiratorial dimension of creationist culture, in which they claim a marginalized identity amid a public life dominated by ‘secular humanist’ proponents of evolution (cf. [Toumey 1994](#); [Butler 2010](#)). In response, creationists construct a stance in which they are revealers: making clear how creationism is constantly censored by ‘evolutionists’ who promote an ‘atheistic’ and ‘un-biblical’ worldview. A common expression of this stance is to coach creationist media consumers on how to read, listen, and watch popular culture, news, and scientific research. In turn, part of fundamentalist enculturation is learning to look for, and find, the naturalization of evolution and its flipside, the suppression of creationism.

For example, in April 1996 the Institute for Creation Research (a creation science organization formerly based in San Diego and relocated to Dallas in 2007) published a pamphlet commenting on new images released by the Hubble Space Telescope, “New Stars, New Planets?” The author, Donald DeYoung, earned his doctorate in Physics from Iowa State University. In his closing paragraph, he both warns and instructs readers:

Claims of discoveries are flooding in from the new generation of space instruments. These reports are often given an evolutionary “spin,” especially regarding new stars, planets, and origin theories. Creationists are encouraged to enjoy and study the new data and photographs. They should also be ready to separate the unneeded, anti-creation statements that often accompany these reports. Our enlarging view of creation shows a complex universe that completely frustrates any attempt to explain its origin or content by natural processes alone.⁵

A similarly framed article appeared in the April–June 2012 issue of *Answers*. In “The Earths Keep Coming,” the author (unnamed) reports on new data released by the Kepler Space Telescope. Its assessment directly echoes DeYoung, coaching creationist readers in the same way 16 years later:

With each discovery and press release, NASA’s researchers reveal their bias more and more. Kepler isn’t intended as just a research mission for scientific exploration; it’s an attempt to prove evolutionary concepts. If life evolved here—as they already believe—then they assume it likely evolved elsewhere. But they’re missing the bigger point. Each of these planets showcases not the possibility of life, but the far-flung wisdom and power of our Creator.⁶

3. Life in a Young Universe

The U.S.–Soviet Union Space Race and national investments in scientific infrastructure helped mobilize the modern creationist movement. After the Sputnik launch in October 1957, the U.S. Congress authorized “millions of federal dollars to support scientific research and training” ([Eve and Harrold 1991](#), p. 28). This included a \$100 million National Science Foundation program in 1958 to reform public school science curricula, and the formation of NASA that same year. This sharpened a double-edged sword among conservative Protestants who felt alienated from these public changes. It “marked a high point in the prestige of science,” but also a peak in populist “suspicion, mistrust, and misunderstanding” of scientific institutions ([Gilbert 1997](#), vol. 5, p. 7). While the public at large invested significant trust in scientific authority, there was a class-inflected sentiment that elite experts controlled mainstream science and excluded non-liberal political foes.

⁴ “New Discoveries of Order in the Sun,” *Answers* (April–June, 2012). Periodical published by Answers in Genesis, author’s collection.

⁵ “New Stars, New Planets?” *Insight* (April, 1996). Pamphlet published by Institute for Creation Research, author’s collection.

⁶ “The Earths Keep Coming,” *Answers* (April–June, 2012). Periodical published by Answers in Genesis, author’s collection.

The Genesis Flood appeared in February 1961, just a few months before the first human traveled in outer space. Despite the zeitgeist, early creation science had little to do with astronomy. In Morris and Whitcomb's 500-page book there are only two entries, each one page long, that address "the origin of the solar system" and "the origin of the universe." As part of the effort to establish itself as a legitimate alternative to evolutionary science, creation scientists formed their own research journal in 1964 (*Creation Research Society Quarterly—CRSQ*). The inaugural issue included a one-page article, "On the Origin of the Universe," that used the physics of light measurement to argue for a young universe. Over the next decade, *CRSQ* published several space-oriented articles, but none were authored by individuals with advanced degrees in astronomy. A 1973 review surmised that "much work remains to be done in the area of creationist astronomy." (Mulfinger 1973, pp. 170–75).

The first book-length account of creationist astronomy appeared in 1979, Paul Steidl's *The Earth, the Stars, and the Bible*. Though not sporting the academic credentials of later figures such as DeYoung and Lisle, Steidl's book is well-remembered in the creation science community. Danny Faulkner, another AiG researcher, earned his doctorate in Astronomy from Indiana University-Bloomington. In his 1998 review of creationist astronomy, Faulkner comments favorably on Steidl, though is also clear to mark the professional distance separating them:

Because [Steidl's] book does not go into great depth nor is it a primary source in the sorts of arguments that will be described here, it will not be referenced often in this paper. Its great strength is that it is a general treatment of astronomy that covers a broad range of subjects with emphasis given to Biblical and creation interpretations. While nearly 20 years old, the book has aged very well considering the rapid advances in astronomy in the intervening period. (Faulkner 1998)

While Steidl advanced creation science's attempted incorporation of astronomy, it was a popular cultural phenomenon that escalated the effort. *Cosmos: A Personal Voyage*, hosted by Carl Sagan, aired in 13 episodes on the Public Broadcasting Service from September through December 1980. Sagan, who earned a doctorate in Astronomy from the University of Chicago, pitched the series as an "attempt to bridge the division between the scientific community and the general public" (Lessl 1985, p. 177). The series budget of eight million dollars was, at the time, a record for U.S. public television and it received widespread critical acclaim, earning Emmy awards and Peabody awards. In a rhetorical analysis of the series, Lessl (1985) argues that Sagan performed a double-voiced stance of seer-saint that leveraged and celebrated the cultural authority of science: "As seers, scientists hold the keys to all cosmic secrets, making the ways of evolutionary progress known to the human species. As saints, they are in closest touch with the evolutionary essence of the cosmos; they purify the human species by their redeeming presence among us, and as teachers they bring us closer to what will pass as ultimate" (Lessl 1985, p. 178).

Sagan's rendering of life in the universe resonated with a long tradition of figuring outer space as sacred space, and encounters with the vastness of space as a religious experience (Weibel 2016). In doing so, he drew together religion and science in a materialist register, "reaffirming the soundness of evolutionary theory and refuting theistic notions of creation" (Lessl 1985, p. 178). The series positioned creationism as absolutely at odds with science and unviable as an explanation of the past. This direct critique, coupled with the series' popularity, and its airing on public television, raised the ire of creationists and fit snugly in their narrative that evolution was public dogma and creation science was censored truth.

Consider one example published soon after *Cosmos* aired, a review of the series in a collegiate newsletter called *Origins Research* that was founded in 1975 at the University of California-Santa Barbara. Authored by Dennis Wagner, the newsletter's editor at the time and an engineer by training, the review appreciates Sagan's eloquence but pans the series as non-scientific:

It was disturbing, however, to watch a very popular scientist stand before a 150 million viewers and proclaim that what he was offering them was science and facts when in reality he was presenting to them Carl Sagan's philosophy of life. (Wagner 1981)

Throughout, Wagner works to de-legitimize Sagan as an untrustworthy source. Citing a reference Sagan makes to humanity's connection with the cosmos, he quips:

We are the soul of the cosmos—sound familiar? If not, then a visit to your local guru might clear things up. (Wagner 1981)

Wagner's review is grounded in both the theology and discursive strategies of creationism. He draws in a moral critique of evolution by assessing how Sagan would address the question of life's purpose:

The impact of survival ethics is both obvious and devastating. The sick, the poor, the weak, and the uneducated become more casualties of evolution. (Wagner 1981)

And, he draws on a strategy that became a pillar of creationist argumentation, a distinction between "observational" and "historical" science. While not a meaningful distinction among mainstream scientists, creationists assert this as a way to claim that evolution cannot offer the certainty it promises because empirical observations about the past cannot be made in the same way as those about the present. He writes:

Several times Sagan stated very matter-of-factly that the laws of Nature are the same everywhere in the universe. I admit that this is a reasonable working assumption. But unless I had been to the ends of the universe in my starship to conduct my experiments, I don't think I would venture to make such a statement as a fact of science. Even Captain Kirk appears more scientific in his analysis of the universe than Captain Sagan does at times. (Wagner 1981)

Creationists used the success of *Cosmos* as an opportunity to re-assert their conspiratorial claim of public marginalization and to capitalize on the renewed public excitement about astronomy. In the wake of the series, creationists placed new emphasis on astronomy; that is, they made a more concerted effort to incorporate this field of science into the domain of creation science. A compilation of CRSQ articles, *Design and Origins in Astronomy*, was released in book form in 1983. DeYoung published *Astronomy and the Bible* in 1989, the first creationist astronomy book written by a PhD-educated scientist. This post-*Cosmos* period of focused incorporation solidified astronomy in the creationist repertoire. In the decades to come, creationist organizations would add astronomers to their paid staff and integrate them into their systems of cultural production. For example, Answers in Genesis added Lisle and Faulkner, and the Institute for Creation Research added Lisle following his employment at AiG and Jake Hebert, who earned his doctorate in physics from the University of Texas-Dallas.

Performing Incorporation

Creation science's work of incorporating astronomy is an ongoing labor. It is continually performed and circulated through printed books and articles, online materials, DVDs, programming at creationist attractions, public presentations, and media interviews. Here, I present just two examples of how Answers in Genesis seeks to authorize the legitimacy of creationist astronomy for its audiences.

Visitors to the Creation Museum in northern Kentucky have numerous opportunities to encounter creationist astronomy. The most popular venue, and the costliest for the ministry, is the Stargazer Planetarium. Located inside the main building, the digital projection theatre has been part of the site's programming since the opening in 2007. In 2019, the Creation Museum invested roughly five million dollars in an extensive redesign, which included a 1.2-million-dollar upgrade for the planetarium: new projectors, new computer software and hardware, a tilted dome to replace the previous ceiling,

and an acoustic system enabling a more immersive aural experience. Every day, multiple shows play on rotation. The planetarium's inaugural show, "Created Cosmos," a 22-minute production written by Jason Lisle, still plays every day, eight times a day Monday through Saturday.

"Created Cosmos" greets audiences by combining discourses of awe in the face of a vast universe, an affirmation of humanity's original sin, the claim of a sovereign creator God, and a promise that astronomy is a tool for religious understanding.

As we learn more about the universe we are continually amazed at the astonishing diversity and beauty we find. Though marred by the Curse, the universe still exhibits the handiwork of the Lord. By learning more about the intricacies of the celestial realm we gain an infinitesimal glimpse into the infinite mind of God. (Lisle 2007)

The show begins with the earth's distance to the moon and moves to the orbital paths of the planets in our solar system, the distance to other star systems within our galaxy (e.g., Alpha Centauri), the location and composition of the sun, well-known star constellations, globular clusters, the scope of the Milky Way, the presence of other galaxies composing our universe, and concludes by zooming back in to the earth with a satellite view of the Creation Museum. As it takes audiences on this galactic journey, the show returns to the organizing argument that only creationist astronomy can offer full access to the truth of the cosmos. For example, when presenting the constellation Orion's Belt, it compares stars of differing heats:

Blue stars like Alnilam are very luminous, they expend their fuel quickly and cannot last billions of years. So, blue stars remind us that the universe is much younger than is generally claimed. Secular astronomers are forced to assume that stars, like Alnilam, have spontaneously formed in the recent past. However, star formation is riddled with theoretical problems and has never been observed. (Lisle 2007)

Along with these critiques of mainstream science, the show performs fundamentalist theology by equating the vastness of space ("distances that we cannot truly comprehend") with the power of God and the miracle of humanity's special place in creation. Its closing works as something of an astronomical altar call, pitched dialogically in response to Sagan's discussions of "star stuff":

The earth may seem an insignificant speck compared to all that God created. Yet, this tiny world is where God placed the crowning jewels of His creation. Of all that the Lord created, human beings alone have the privilege of being made in God's own image. And though we have rebelled against our creator, he's paid the penalty for our treason. It was on this small planet where the creator of the universe became a man and died our death. He then rose again and offered forgiveness for all who call upon his name. It is fitting that we should honor God for who he is and for what he has done. (Lisle 2007)

If "Created Cosmos" performs the incorporation of astronomy onsite for visitors to the Creation Museum, a slew of articles does so for visitors to the Answers in Genesis website. The organization's current staff astronomer, Danny Faulkner, writes regularly on topics ranging from "Alien Abductions: Freaky or Fiction?" to "Cosmic Bubble Hypothesis Highlights Another Big Bang Problem." Amid this abundant selection, Answers in Genesis continues the strategy of transforming widely publicized popular culture into an opportunity for creationist incorporation. As creationists did with the 1980 *Cosmos* series, Answers in Genesis used the 2014 *Cosmos* reboot, hosted by astrophysicist Neil deGrasse Tyson, to circulate the theology of creationist astronomy.

For each of the 13 episodes in the 2014 *Cosmos* production, AiG released a review and group discussion guide. In an introductory video recorded in his Creation Museum office, AiG CEO Ken Ham frames the review series with the same revealer stance analyzed above, as a way for creationists to understand the pop culture mediascape as corrupted by evolution:

[*Cosmos*] really is a very intense attempt to brainwash and indoctrinate people in the religion of evolution. Basically, you know, worship the stars because the stars gave birth to us... I encourage you to use this as a resource tool from Answers in Genesis to equip you, to prepare you, to equip your children, your students, ready for what they're going to hear out there in the world that's going to try to drag them away from the truth of God's Word. (AiG 2014)

The author of the reviews is one of AiG's employees, a medical doctor named Elizabeth Mitchell. Throughout, Mitchell rejects *Cosmos*' self-presentation as an attempt to improve the public's scientific literacy and claims to reveal it as yet another attempt to naturalize evolution as the only rational view of how the universe began and life emerged. For example, her review of the series' first episode challenges Tyson's assertion that there is empirical proof for the Big Bang. Appealing to the scientific legitimacy of her colleague, Faulkner, she quotes one of his weblog posts:

This is not "observational evidence" about our origins but rather "an interpretation of the data, data that could be interpreted a number of different ways apart from the big bang." (AiG 2014)

Ultimately, of course, Mitchell's reviews are designed to bolster creationism's incorporation of astronomy. They do so by circulating the same claim that has always animated creation science, that science properly done will only ever support creationism. This is addressed directly in Mitchell's discussion leader guide for episode one, where she teaches group leaders what questions to pose and how to answer them. Here, she returns to the enduring creationist discourse strategy that natural order must reflect supernatural order:

Do Bible-believing Christians reject science? ANSWER: No, Bible-believing Christians not only use science but also understand that the scientific method works because God created an orderly world governed by the laws of nature. While the Bible is not a modern scientific textbook, whenever it addresses a scientific point, it is a completely reliable yardstick to guide our discoveries and interpretations of scientific questions. Bible-believing scientists understand that the reliable and predictable laws of nature on which science depends come from our all-powerful Creator. Bible-believing scientists enjoy discovering how things work that God created and learning how to use science to benefit mankind. (AiG 2014)

4. Conclusions

What value does outer space have for creationist cultural production? This article has ventured an answer to this question, arguing that creation science has sought to incorporate astronomy into its repertoire. Energized by the public popularity of the 1980 *Cosmos* television series, creationists have spent four decades constructing a claim that astronomy testifies to their young universe interpretation of the biblical Book of Genesis as literal history. This process of attempted incorporation is performed through print and online media as well as highly choreographed productions, such as planetarium shows at creationist museums. The attempt to mobilize astronomy in this way illustrates an enduring creationist strategy: to challenge the scientific and cultural authority of evolutionary science, re-directing legitimacy to their own account of history and, ultimately, the theo-politics that orients the movement.

Creationism expresses a particular configuration of the religion-science relationship. Namely, it is a hierarchical relationship in which science is always subordinate to religion; truths about the natural world can only ever support the supernatural truths revealed by divinely authored scripture. The case of incorporating astronomy certainly illustrates how this hierarchical relation is performed, though that is not the primary goal of this analysis. More than illustrating this well-known configuration of religion-science, the goal has been to make clear one way in which power operates in the creationist movement. Whatever else it is, creationism is an attempt to wrest authority away from evolutionary science and secure it with fundamentalist Protestantism.

The creationist claim to cultural authority and legitimacy is an ongoing effort, composed of strategies that abide by a system of cultural logics, material practices, and discursive tactics. Following Lincoln (1994), I understand authority as an emergent process, not an already cohered product that is then sought, gained, or lost. Authority is “an effect, the capacity for producing that effect, and the commonly shared opinion that a given actor has the capacity for producing that effect” (Lincoln 1994, pp. 10–11). Authority is fundamentally relational and grounded in trust: “[It] depends on nothing so much as the trust of the audience, or the audience’s strategic willingness to act as if it had such trust” (Lincoln 1994, p. 8). The process of incorporation outlined here is one example of how this appeal to trust is performed by creationists, as they dialogically construct a fundamentalist self against an evolutionist other.

In this framework, authority is contestable; it is exerted and challenged, obeyed and critiqued, internalized and rejected, persuasive and doubted. Lincoln argues that these qualities are constantly negotiated through two kinds of cultural labor: constructive and corrosive discourse. Constructive discourses work to bolster, promote, support, and otherwise reproduce appeals to the public trust. Through biblical authority, embattled identity, and the revealer stance, creationist incorporation is partially grounded in constructive labor. Corrosive elements are also present; discourse that seeks to challenge, erode, critique, damage, and otherwise disrupt or undermine competing authoritative sources. Creationist incorporation integrates tactics such as portraying evolutionary arguments and pop culture phenomena as both morally corrupt and intellectually flimsy to foster anti-evolution sentiment.

Taken together, and working in tandem with other forms of creationist cultural production, the incorporation of a scientific field is targeted toward divesting legitimacy away from evolutionary science’s established authority. By claiming astronomy as their own, creationists re-create a broader project of rendering authority as a zero-sum game and making a bid for total legitimacy.

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Article

Future-Day Saints: Abrahamic Astronomy, Anthropological Futures, and Speculative Religion

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Abstract: In the Church of Jesus Christ of Latter-day Saints, there is an intense interest in creating “speculative fiction”, including speculative fiction about outer space. This article ties this interest to a broader tradition of “speculative religion” by discussing the Mormon Transhumanist Association. An interest in outer space is linked to nineteenth and twentieth-century speculation by Mormon intellectuals and Church leaders regarding “Abrahamic Astronomy”. The article suggests that there is a Mormon view of the future as informed by a fractal or recursive past that social science in general, and anthropology in particular, could use in “thinking the future”.

Keywords: religious transhumanism; Church of Jesus Christ of Latter-day Saints; speculative religion; outer space; folk astronomy; anthropology of time; Kolob

The volume is hardcover, and its dimensions are a standard picture-book nine and a half inches by eleven. Its cover displays a comic-book-style drawing of a brown-skinned woman in white robes. Her hands are outstretched towards the viewer, and they ripple with white and yellow energy. She is standing in the middle of an Edenic-looking copse of ferns and palm trees, and just slightly behind her, there are what looks like alien hybrids of a hedgehog and a fur-covered penguin. Except for a single black eye in the middle of their foreheads, these creatures are otherwise faceless ciphers. Behind her is a strange stone temple, carved in the shape of either three robed, multiple-eyed figures, or possibly of a single figure with three heads. Behind that grey spire is a skyline of tropical mountains, set against a peach-colored alien sky; this sky is made complete by a single large planet or moon looming in the background (See Figure 1). Opening the book up, we see that the action in this book is set on a planet that was visited three thousand years ago by an alien messiah; this messiah had died and been resurrected on some other planet, only to then make an appearance on this world as well. That alien messiah prophesized the coming of immigrants from other solar systems. In the following millennia, different waves of alien refugees from numerous other star systems arrived on this planet. All of the worlds these refugees heralded from were planets that had been visited by this messiah at roughly the same time three millennia ago. On each planet where the messiah appeared, he took the form of whatever was the sentient lifeforms he preached to. The one exception is a planet named “Earth”. This planet also had contributed refugees to this strange settler world; on Earth, though, apparently, the messiah did not visit the planet in passing, but lived, died, and was resurrected there. After this short history lesson, the rest of the book is a mix of comic-book style illustrations with word balloons, and on the other large illustrations accompanied by long passages of texts. These comic pages and narratives tell the story of a team of unlikely looking superheroes who defend all these settlers on this alien world. In addition to the woman on the cover (her name is Liahona, and she holds “the Powers Of The Priest”), there is: a living skeleton with seer-stones for eyes; a scythe-wielding six-eyed blue-skinned warrior who wears a prairie dress; and a living stone capstone (a “sunstone”) who, when not serving as the team’s medic, plays in a ska band with his husband. There is also a white man in a grey business suit, who goes by the name “The Good Bishop.” They battle a team of evil antagonists called “The Curses”, whose members include: Lucifer (in the guise of “Morning Star”);

the biblical “Mister Cain”; the “Bad Bishop” (who is identical in appearance to the good bishop); and an animated, sentient cup of coffee who goes by the name “Hot Drinks”. Parenthetically, the reason that all these aliens come to this planet is so that they can be close to a world called “Paradise”, which is also the “home of the Celestial Parents”. Both Paradise and New Eden, the name of the planet that the events of this book are set on, orbit a star named Kolob. The title of this book is *Future Day Saints: Welcome to New Zion* (Page 2020), and it is at once a love letter to, and a critique of, The Church of Jesus Christ of Latter-day Saints, otherwise known as the Mormons Church.¹



Figure 1. Cover of Future Day Saints. Artist: Matt Page.

¹ A note on the use of the term Mormon: In the August 2018 General Conference (a bi-annual series of speeches from Church leaders that all members of the Church of Jesus Christ of Latter-day Saints are encouraged to listen to, either in person, or more likely via broadcast or internet live-stream), President Russel M. Nelson stated that members should only use the Church’s full name, and rejected the use of “Mormon” to refer to the institution, its members, or the associated culture. I refrain from following his admonition here for two reasons. The first is that almost the entirety of the research on this project was done before the announcement, and hence my engaging in such a change in nomenclature would be ahistorical at best, revisionary at worst. The second reason is that the Mormon Transhumanist Association itself, the particular group I worked with the closest, has declined to change its name. Part of the reason for this is institutional, having to do with their status as a non-profit corporation. Another reason is that the term Mormon, though initially derogatory, was embraced by Joseph Smith, the founder of the Church of Jesus Christ of Latter-day Saints; further, a large part of the nineteenth-century religious speculative movement that the MTA draws some of its inspiration from having understood itself to be engaged in “Mormonism” as well. The MTA notes that several religious movements also trace their origins back to Joseph Smith and include the Book of Mormon in their canon; to change the association’s name could be read as alienating these other constituencies.

The author of this book has done other forms of “serial art” before, including a series of trading cards called “Garbage Pail Saints”, (a Mormon-themed parody of the comedic Garbage Pail Kids card series of the nineteen eighties) as well as a series of Mormon votive candles (votive candles are not a usual part of devotions for Latter-day Saints). This, though, is his first offering that could be classified as “Mormon Science Fiction”. However, it is certainly not the only offering in this genre.

Mormonism—most commonly represented by the Church of Jesus Christ of Latter-day Saints—is the “restored Gospel” tradition started in the 19th century United States by Joseph Smith, a man who is generally considered to be a “prophet, seer, and revelator” by the faithful. The term “Restored Gospel” is used because much of Mormon practice and doctrine, such as temple worship and the priesthood system, are held to be a return to original forms of religiosity that go back as far as the Garden of Eden, but which were lost in the three centuries immediately following the death of Jesus, in a period that is referred to as the “Great Apostasy”. One of the distinctives of Mormonism (and there are numerous distinctives, as evidenced by the fact that Mormons sometimes describe themselves as a “peculiar people”) is that there is a robust tradition of Mormon science fiction. The contributions range from works almost universally treated as classics in the genre (such as Orson Scott Card’s *Ender’s Game*) to genre television shows (the first iteration of *Battlestar Galactica*). It should be stressed that the breadth of Mormon speculative fiction stands also stands out in the gross, qualitative, demographic sense. An online “Bibliography of Mormon Speculative Fiction” lists over five hundred authors who are affiliated in some way with the Church, and this is a list that has not been updated since 2014. This is not to mention the numerous books, penned by non-Mormons, that feature Mormon characters, such as Charles Stross’s *Accelerando* (Stross 2005), which includes references to the fictional “Reformed Tiplerite Church of the Latter-day Saints”, and works by James S. A. Comey (the pseudonym for the co-authors of *The Expanse* book series), which features as a plot device a Mormon generational ship, the L.D.S.S. *Nauvoo*, that is intended to travel to Alpha-Centauri.

This explosion of literature has been noticed by commentators more than once (see, e.g., Busby 2020a, 2020b, 2020c, 2020d; Morris and Dalton-Woodbury 2010). Part of the reason for this has to do with “founder effects”. Early on, institutions were set up that made envisioning science fiction careers easy; Brigham Young University (also referred to as BYU), the predominant Church affiliated University, has for decades produced a science fiction periodical called *Leading Edge*; the same educational institution houses an annual conference dedicated to speculative fiction (entitled “Life, the Universe, and Everything”, after the comedic Douglas Adams science-fiction novel of the same name). Then there is a storied writing class at the University that transitioned into a long-running writing group, named “Xenobia”, which is active to this day. Jokingly entitled “the course that would not die” (Vasicek 2010), this writing-group has worked to build and foster a long-standing Mormon science fiction literary community. It may seem unlikely that a single University could do the work to produce the quantity of Mormon writers of speculative fiction that exists, but given BYU’s status among Mormons as a center for learning, a surprisingly large slice of Mormon intellectuals have passed through that school, and these intellectuals have in turn served as a catalyst for an even larger community. (We will see that BYU will be quite the *leitmotif* in our discussions later on).

These historical institutional arrangements are not the only factor in play. While the sociological organs may have been the means through which this exploration of speculative literature was actualized, the potential for this thought can be found in religious sensibilities common to the Church of Jesus Christ of Latter-day Saints. Elements of Mormonism’s cosmo-religious imagination work to catalyze any individual interest among Saints in speculative fiction; as noted by Terryl Givens, there is a “demonstrable affinity between the genre and the faith”. (Givens 2007, p. 320). Given the call of this special issue, this raises a question: do these affinities between a Mormon religious cosmology and a speculative interest in real cosmology offer social sciences in general, and anthropology in particular, anything in regards to potential ways of imagining space and the future in the present moment?

1. Anthropologies of (Absent) Futures and (Religious) Space?

To be clear, we are not speaking of space in the manner customarily discussed—as the social production of topographies and landscapes here on the earth (see, e.g., [de Certeau 1984](#), pp. 91–130; [Low and Lawrence-Zúñiga 2003](#)). Instead, we are speaking about space in the “final frontier” ([Swanson 2020a, 2020b](#); see also [Farman 2020](#), pp. 151–52) sense of the term: the interplanetary and interstellar space of settler-society 20th and 21st century imagination, a place capable of being explored and peopled (though not necessarily peopled by *homo sapiens*).

Now, it is puerile to associate speculative fiction unproblematically with only “space” or “the future”. Speculative fiction explores numerous imaginable scenarios, asking not what *will* happen, but what *could* happen given a set of hypothetical conditions; further, the scenarios selected are not necessarily based on their likelihood of occurrence, but on how interesting the underlying premises are conceptually. Because of this fact, it is better to understand speculative fiction as a form of ideational experiment or critique. ([Shaviro 2016](#)). Additionally, thanks to this genre’s work as a conceptual laboratory or as a mode of critical investigation, “social theory and speculative fiction are two sides of the same coin”, as [Wolf-Meyer \(2019\)](#) has observed. That said, the fact that some science fiction does set itself in a future that has expanded both beyond Earth and the present moment is a point worthy of anthropological interest.

The reason why anthropology might wish to attend to the Mormon speculative imagination is that the discipline has observed that the future has become “difficult to think”—that is, the future has become something that taxes the collective cultural imaginary. As noted by [Guyer \(2007\)](#), due to economic and political shifts associated with neoliberalism, the near to middle-term future has become difficult to conceive of. Guyer’s observation was intended to be an ethnographic one, but it seems safe to say that it can also be applied to anthropology itself. This can be seen in [Valentine et al.’s \(2009, p. 11\)](#) observation that “the future is being conspicuously overlooked as a research project” in the discipline, “despite increasing social investment in future-focused things and practices”. Some of this erasure of the future may be hard-wired into the field; it is easy to argue that participant-observation is inherently presentist by its very nature ([Irvine 2020](#)). Of course, this argument can only go so far: scholars have found ways to ethnographically investigate outer-space-facing human practices that are metonymically linked to the future. ([Battaglia et al. 2015](#); [Messeri 2016](#); [Olson 2018](#)). However, despite these contributions, it appears that we still need to develop ways of framing outer space as an ethnographic and anthropological problem.

This is where the before-mentioned kinship between social theory and science fiction becomes relevant. We can turn to speculative fiction qua “outsider social theory” ([Wolf-Meyer 2019](#)) in order to be able to think what seems to have been inconceivable for the most part in the established, professional anthropological community. However, turning to this body of literature opens up new challenges and possibilities, for there is not a single speculative fiction. Instead, there is a wealth of different speculative fictions informed by the lives and the self-understandings of authors from different communities, including, as we have seen, lives and understandings of members of the Church of Jesus Christ of Latter-day Saints.²

The idea of religiously inflected imaginations of space is something that, for the most part, has not been addressed by anthropology, putting aside a single exception. (I am thinking here of the work of Deana Weibel, who has addressed both confessional religion in space, as well as “magic” in the form of astronaut superstition ([Weibel 2007, 2015, 2017, 2019a, 2019b, 2019c, 2020](#))). This lack of attention means that anthropology has not yet come to grips with how to handle religious speculative thought that operates in a register that yearns to escape earth’s orbit. What to do with such speculation—and especially what to do with the aspect of it that might read as critique? Such work should not be automatically waved away because of its religious provenance; such an origin does not mean that

² The premier example of the situatedness of speculative fiction is the sub-genre of Afrofuturism (See [Womack 2013](#)).

on first principle, it cannot be engaged in critical investigation (Asad et al. 2013). Additionally, potentially turning to Mormon science fiction need not be an exercise in post-secular anthropology (c.f. Fountain 2013) or even an explicitly theological endeavor (Menses et al. 2014). Instead, given the antinomies between exclusively confessional religious thought and anthropology (Engelke 2014), it is better to think of this as a dialogic project, an attempt to have a transformative encounter with a different mode of being in the world, instead of merely dissecting it, and to do so without necessarily abandoning core intellectual principles (see, e.g., Tomlinson 2020).

There is another reason, though, why Mormon speculative fiction cannot simply be “ported” into the academic mechanism of anthropology to become “ethnographic theory” (Da Col and Graeber 2011). That is because there are elements of Mormon thought that may not be easily digested by anthropology. Views on gender, sexuality, and race are not monological in the Church of Jesus Christ of Latter-day Saints; furthermore, Church doctrines on these issues have been reconfigured in the past, and there is every sign that doctrines regarding sexuality and gender are capable of being reconfigured yet again in the future (Petrey 2020). Further, while many progressive Mormons find themselves leaving the Church (Brooks 2018), there is also a respectable number who remain within the Church, even if they are nowhere close to forming a plurality, let alone a majority. Still, while there is some evidence that generationally (Riess 2019), Mormon views on this issue may be shifting, on the whole, opinions on this subject among other elements of the Church would not be in line with the anthropological consensus. Additionally, this is putting aside the fact that even though polygamy (at least as a practice occurring among the living) has been rejected as a Church doctrine for over a hundred years (Van Wagoner 2002), its legacy still makes discussions of kinship and gender fraught (Pearson 2016).³

Given this, it seems best to not simply understand whatever conceptual work is being done in Mormon science fiction (for it is undoubtedly sure that the wealth of literature discussed above cannot be reduced to a single vantage point), but to examine the underlying conditions of possibility as well, so that anthropology can approach this in a way that opens itself up for the necessary critique (Bialecki 2018a), while still maintaining its distinctiveness in how it apprehends problems (Bialecki 2018b). This will have another advantage. Focusing on broader formations allows us to see what the social effect of speculative thought is. A study of speculative thought that does not have within it avenues that double back from the imaginative and the virtual to the social, and thus do not thread backs to concrete expressions, might say something about the potential cognitive combinatory possibilities of the human species, but an interrogation of such forms does not tell us anything regarding how actual collective processes operate.

But how does one study speculative imagination, not as fiction, but as something lived in the world?

2. “Speculation Is My Religion” (Methods and Object)

Future Day Saints did not fall into my lap from out of the sky, or at least not literally. Rather, a friend of mine sent me a message telling me of the book’s existence while we were on a larger Zoom call. The topic of the Zoom call was what it would take for humanity to settle the solar system and then later the stars. At some point in the conversation, these hypothetical settlers were compared to the handcart pioneers, the celebrated (Bielo 2017) Mormons who migrated on foot to Salt Lake City and environs to escape persecution they experienced in the United States. Typically held in person in a strikingly large, furnished basement near Provo, Utah (the online format was a result of the pandemic of 2020), this Zoom meeting was the monthly meet-up for the Utah branch of the Mormon Transhumanist Association.

³ It should be noted that, while far from homogeneous, the particular group discussed later in this paper, the Mormon Transhumanist Association, leans towards the socially progressive side of the Mormon political spectrum.

The Mormon Transhumanist Association, or “MTA” as it is often referred to, is an organization whose purpose is to create a community for those interested both in Mormonism and Transhumanism. With the approval of the Mormon Transhumanist Association, I have been studying them for a half-decade now. I have spent numberless hours at their various online forums, have conducted well over a hundred hours of interviews, have attended four annual conferences, and have studied over ten years of survey material on the group.

To understand the MTA, you have to understand transhumanism. Transhumanism is the anticipation of, and advocacy for, imminent innovations in fields as diverse as nanotechnologies, gerontology, cryonics, and artificial intelligence that *might* be so species-transformative that those who adopt these technologies will have effectively transcended the human state, becoming something else, something greater, altogether. On the whole, transhumanists tend towards atheism, and often a “new” atheism that is not just skeptical regarding religious truth claims, but hostile to religion having any space in the public sphere. When given anthropological attention, transhumanism is (rightly) seen as a project concerned with achieving immortality through technical means (see [Bernstein 2019](#); [Farman 2020](#)), and escaping death does indeed seem to be the chief aspiration of most transhumanists. However, that does not exhaust transhumanist ambitions. There is also a cosmological edge to transhumanism, in both the anthropological sense of a concern for ultimate horizons and all-encompassing totalities, but also in the less figurative sense of being concerned with the origins and ultimate fate of the universe. Sometimes this takes the form of speculation about the origins of the universe; a favorite hypothesis here for many Mormon Transhumanists is that this world is a computer simulation of some sort (see [Bostrom 2003](#)). However, when beginnings are not being contemplated, it tends to imagine the propagation of humans and post-humans through outer space; and sometimes this is not just the propagation through outer space, but the transformation of it, where intelligence first colonizes the universe, and then refashions it across the board into thinking matter ([Farman 2012, 2020](#), pp. 197–235).

The Mormon Transhumanist Association is, as the name would suggest, a society for Mormons who are interested in, and often quite enthused about, the same technological prospects that excite secular Transhumanists. While not massive in size, the group’s growth had been exponential, running from an original fourteen founding members in 2006 to roughly seven hundred and fifty at the time of this writing. What the MTA lacks in size, it makes up for in influence; it is both the largest, and oldest, religious transhumanist organization; it was also the first religious transhumanist association to receive an official affiliation with H+, the largest existing umbrella organization for transhumanist groups. The MTA is also taken as a model for other religious transhumanist groups, particularly for the more recent Christian Transhumanist Association, with which it has an interlocking board. For the most part, the MTA lives on the internet, through a Facebook page, a network of Twitter users, and a list-serve that has decelerated as the group’s social media presence has intensified. This should not be taken to mean that the group is entirely virtual, however. The chief ritual event in “meatspace” on the MTA’s calendar is the annual conference, where both members and invited guests (drawn from both well-known secular transhumanist and Mormon public intellectual pools) present papers and engage in discussion. In addition to the occasional family social, there are also semi-regular meet-ups in different cities: Seattle, the Bay Area, and Provo (the home to BYU).

The organization is interested in recruiting; for instance, it has produced several “primers” (introductory study guides to the overlaps between Mormonism and Transhumanism). This interest in recruiting is partly because of some anxieties about the constitution of its membership; the organization is overwhelmingly male (though there have been female board members and CEOs) and is rather white. It also does not exclusively consist of members in good standing with the Church, though this is not a source of concern in the way that the gender imbalance is. While most members belong to the Salt Lake-based Church of Jesus Christ of Latter-day Saints, a handful belong to other Churches that spring from Joseph Smith’s “restored gospel” tradition, and many are ex-Mormons who still have some affinity with the culture of Mormonism if not the Church itself. This relative breadth in

membership is purposeful, as from the start, the organization rejected the possibility of being a more narrow, confessional group.

The demographic profile just outlined is (again) a function of founder effects. Most of the founding cohort were male BYU graduates who, despite having degrees in fields as varied as linguistics, music, and philosophy, found themselves working in Utah's burgeoning tech sector during the first decade of the twenty-first century. Through various online sites (such as beliefnet.com) they developed a community of individuals interested in debating religion and discussing technology, and as these conversations took place, many of the members found themselves wondering whether Mormonism's eschatological promises might not be something doled out by divine favor, but instead something that God expected believers to achieve through their own efforts. There are four aspects of Mormonism that made this thought possible. The first is that it is a thoroughly materialist religion (for example, there is no such thing as *ex nihilo* creation in Mormonism). While "materialist religion" may seem to be an oxymoron, this claim holds because it argues that everything is made of matter, including God, who is assumed to have a physical body and be situated in a particular place, a fact that will become important later in this essay. Second, concomitant with this belief is the tenet that miracles are not breaks with the natural order, as his held in most expressions of Christian imaginaries, but instead effective use by God of natural laws in ways that are presently beyond our ken. Third, there is the implicit assumption in this rule is that natural laws precede God, which (fourth) makes sense since Mormonism also endorses a full-throated vision of theosis (literally becoming a God) as the ultimate goal for humanity, or at least for those humans who show the proper ethical standards and moral sensibility by both endorsing and existing in accord with the Church of Jesus Christ of Latter-day Saints (either in this life or the next, since Mormons believe in proxy baptism for the dead).

Given these doctrinal propositions, it is easy to imagine how a set of Mormons who are already deeply invested in technology, but also have their intellectual appetites whetted by their university training in fields such as the humanities, could imagine theosis as a technical achievement. Such a reimagining of their religion ended up having unforeseen social benefits. For instance, it allows for a rationalist presentation of their faith to unbelieving colleagues in the technological sector. Religious transhumanism also had advantages in their interaction with fellow Mormons. Seeing religious eschatology as a human, technical achievement (albeit one that was perhaps facilitated by a super-human intelligence when it created either the species, the world, or the universe) did certain work for Latter-day transhumanists who had come to doubt tenets of their religion when it is couched in traditional, "supernatural" terms. Religious doubts, sometimes about the supernatural, sometimes about the history and operation of the institutional Church, are increasingly driving Mormons to disbelief; paradoxically, it is often those who start with a serious investment in the truth claims of their religion that end up becoming skeptical of it (see Brooks 2018). The ideas promulgated by the MTA allowed these Mormons to still present themselves as members in good standing of the Church (though perhaps slightly odd members). This capacity to present oneself as a Church member is important in a world where kinship networks, sexuality (and particularly marriage), and even economic practices are tightly intertwined with religious belief, and where leaving the Church could have disruptive effects on all those categories (Bialecki 2020; Brooks 2018). However, most of all, the MTA has allowed members to open up their speculative horizons. While much of the talk in the MTA is about near term technological horizons, they also speculate about *what* a transhumanist future may be like. Additionally, many members, particularly the ones who are taken with theosis as a religious or ethical proposition, speculate as to the processes through which, over time, Mormon eschatological promises could be made real. As one Church member in good standing phrased it, when asked about the role the MTA plays in his religious life, "speculation is my religion". This is, in a way, Mormon speculative fiction, but as carried out in lives and conversations, as opposed to the restricted space of texts produced by a particular writing industry.

This is not merely about futurist theological musings. This speculative interest finds concrete expressions in numerous ways. There is, of course, a lively interest in consuming science fiction

literature in general, including many works penned by Mormon authors. The literature read does not explicitly address outer space as a thematic; for instance, one story that is commonly known and respected in this audience for its melding of Mormon and Transhumanist themes is Steven Peck's "For Avek, Who is Distributed" (Peck 2015, pp. 11–14), in which a future Mormon religious official struggles to find a way to baptize a spatially distributed artificial intelligence who wishes to convert; they eventually hit on conducting the baptism by proxy, as is done in the Mormon practice of baptizing the dead. However, other works more directly involve outer space, even if their ties to Mormonism are more apparent in themes than direct references, such as in Orson Scott Card's *Worthing Saga*, which has elements drawn from Mormon cosmology (as just one parallel, it features a planet settled by a single, god-like man who over ensuing ages continues to interact with his progeny).

However, this is more than just passive consumption of genre literature. Space travel is a common topic in both monthly meet-up discussions and the yearly conferences. One meet-up spent over an hour talking about Don Lind, a Mormon space-shuttle astronaut who received permission from NASA to wear his temple garments—often referred to as "magic underwear" by Church detractors—underneath his spacesuit.⁴ Online forums often contain quite technical debates about issues such as government-backed and commercial spaceflight; an example is a long-running thread critiquing the software coding practices that were being used by SpaceX, Elon Musk's space-travel business (Bialecki 2020, pp. 6–7).

Sometimes this interest can take the form of rather ambitious, large-scale personal projects. One member, a computer programmer for a large entertainment corporation, has, as an individual, recreational project, used mathematical graph theory to analyze astronomical data sets. This analysis was used to map possible pathways between stars that could potentially be used as routes for human (or extraterrestrial) travel through the "local" region of space—with local meaning here the two thousand stars closest to the earth's sun. This project ended up being presented as both a publication and as a session at GraphConnect, the most prominent annual conference dedicated to the use of graph databases. This work, in turn, led to a collaboration with a postdoc SETI researcher. That later work expanded on the prior project, and used a much more recent astronomical database to map potential networks between stars with known exoplanets; this project was intended to assist scientists looking for technosignatures that could index the presence of alien life.

3. Abrahamic Astronomy

This full-throated Mormon interest in both space and speculation is arguably noteworthy in its form, and perhaps in its level of intensity as well. Some of the particular social and institutional possibility conditions of it have already been addressed, with education, and particularly BYU, being a recurrent theme in both discussions of Mormon speculative fiction and the Mormon Transhumanist Association. But what shaped this imaginary at the level of concepts and cultural material?

While an explicit interest in transhumanism, strictly understood here to mean the larger secular contemporary movement, is unusual in contemporary Mormonism (even as it is rooted in some distinctively Mormon doctrinal claims), a wider Mormon interest in religious speculation is not. Consider this: Joseph Smith's theological innovations had broken sharply from the more conventional forms of Protestantism that dominated the United States and the United Kingdom at the time. Between the radical materialism already mentioned, and the heady idea that God was once a man (which in itself suggests the existence of other Gods who eased the way for the Mormon God to undergo theosis), much of the traditional Christian metaphysics had to be reimaged. Throughout the nineteenth and twentieth centuries, many Mormon intellectuals, including some who were a part of the highest echelons of Mormon leaderships ("apostles" in Church governance), took on this labor attempting to harmonize Mormon doctrine with then-contemporary science (see Givens 2012).

⁴ On Lind and NASA, see (Lind 1985).

This reimagining included reinventing the relationship between religion and astronomy. Any Mormon reimagining the cosmos, though, would have to deal with Joseph Smith's presentation of revelations concerning the planets and the stars. In part, this was because Mormonism is a post-Copernican religion, meaning that, in harmony with the scientific consensus of the time, it assumed a heliocentric solar system and imagined a plurality of (inhabited) worlds orbiting different stars. The basis of this belief, though, was not astronomical, but theological. (See Paul 1992). For example, the "plurality of worlds" doctrine, which predicts numberless inhabited planets, is based on passages in the Book of Moses, a canonical scripture that Joseph Smith wrote while "retranslating" the Bible through revelation (as opposed to the more conventional means of translation); in it, God speaks to Moses, and after relating a version of the Genesis creation myth, goes on to state that

And worlds without number I have created; and I also created then for my own purposes; and by the Son I created them, which is mine Only Begotten . . . But only an account of this earth, and the inhabitants thereof, give I unto you. For behold, there are many worlds that have passed away by the word of my power. And there are many that now stand, and innumerable are they unto man (Moses 1: 33–35).

In short, the earth is just one world among the many that God has created and populated. This idea, however heady, though, is not the only astronomical discussion in canonical scriptures that are particular to Mormonism.

More cosmological revelations are found in the Book of Abraham, which Smith is said to have translated from some funereal documents that came with an Egyptian mummy that the Church purchased in 1835.⁵ Most of the book is spent presenting an alternative history of the Biblical Abraham, including narrating Abraham's escape from an attempt to sacrifice him by Chaldean priests. Further on, though, via both the Urim and Thummim (understood in Mormonism as a pair of devices used in "spiritual" translation) and revelation from God, Abraham learns about what is sometimes called "Abrahamic Astronomy" (Paul 1992).

Abrahamic astronomy is predicated on the idea of a plurality of worlds, as in the Book of Moses, but also on a hierarchy of celestial objects as presented in the Book of Abraham. There is the star Kolob, which is described as "nearest" to God (Abraham 3: 3), with nearest usually understood in terms of physical proximity, as it was in *Future Day Saints*.⁶ Something that could be understood as akin to time dilation functions on Kolob, where "one revolution was a day unto the Lord, after his manner of reckoning, it being one thousand years according to the time appointed unto that whereon thou standest." (Abraham 3: 4). Additionally, Kolob does work organizing the celestial sphere; that star "governs" the "lesser lights" (which are referred to as the "Kokaubeam"), meaning other stars and planets (Abraham 3: 3, 13, 16).

This revelatory Abrahamic Astronomy fired the imagination of interpreters who were working out a new Mormon cosmology. Many realized quickly that not only would this mean a break with Bishop Ussher's claim that the world began on October 23rd, 4004 BC, but also with the relatively more expansive, but still comparatively recent, attempts at that period to estimate a geological "deep time". As W.W. Phelps, an early leader of the Latter-day Saints, wrote to William Smith (the brother of Joseph Smith),

⁵ There are some divergent views about the accuracy of the translation, particularly after the unearthed papers that may have been used by Smith were rediscovered in 1967. (Previously, it was incorrectly understood that the documents had been destroyed in the great fire in Chicago.) It is the consensus among most non-Mormon Egyptologists that the documents that Smith believes he translated are, in fact, standard Egyptian funerary texts, most likely the "Book of Breathings for the priest Hor". The positions among Mormon Egyptologists vary widely, from agreement with non-Mormon colleagues, to defenses of the accuracy of Smith's translation. See Givens and Hauglid 2019; Larsen 1992.

⁶ Discussions of Kolob, as we will see, vary as to whether it is a star or a planet; this is partly because, in much of the source material that presents the idea of Kolob, the term star and planet are used interchangeably. See Athay 1968, p. 257.

... and that eternity, agreeably to the records found in the catacombs of Egypt, has been going on in this system (not the world) almost 2555 millions of years: and to know at the same time that deists, geologists and others are trying to prove that matter must have existed hundreds of thousands of years:—it almost tempts the flesh to fly to God, or muster faith like Enoch to be translated and see and know as we are seen and known!" (Quoted in [Athay 1968](#), p. 256).

It is ironic that while many Christian religious thinkers were criticizing the geological claims of writers like James Hutton and Charles Lyell for expanding pre-history, Mormons were instead mocking them for truncating the age of the world.

One of the first book-length exposition on Mormonism was by Parley Pratt, an early convert and determined missionary, who later achieved the rank of "Apostle". His 1855 book, *Key to the Science of Theology*, has been described as an "audacious" reimagining of Christian cosmology ([Givens 2012](#)). In it, he spends most of its time sketching out Mormon views on topics such as the "Council of Gods" responsible for the genesis of the world and more particularly for the genesis of humanity, the physical nature of Gods as beings of "flesh and bone", the arc of biblical history, and the "Plan of Salvation" (which is how the salvific and eschatological doctrines of the Church are sometimes referred to). However, near to the end of the book, when he starts discussing what might be called the sociology of Gods, Pratt's statements begin to sound like science fiction. Thinking of the future lives of divine beings, he predicts that

Planets will be visited, messages communicated, acquaintances and friendships formed, and the sciences vastly extended and cultivated ... The science of astronomy will also be enlarged in proportion to the means of knowledge. System after system will rise to view in the vast field of research and exploration! Vast systems of suns and their attendant worlds, on which the eyes of Adam's race, in their rudimental sphere, have never gazed, will then be contemplated, circumscribed, weighed in the balance of human thought, their circumferences and diameter be ascertained, their relative distances understood. Their motions and revolutions, their times and laws, their hours, days, weeks, sabbaths, months, jubilees, centuries, millenniums and eternities, will all be told in the volume of science. ([Pratt 1915](#), pp. 146–47).

Pratt's statement is not just a vision of a cosmic future, but also an imagining of the recovery of a lost cosmic past as well. Pratt goes on to predict that

[T]he science of history will embrace the vast "univercœlum" of the past and present. It will, in its vast complications, embrace and include all nations, all ages, and all generations; all the planetary systems in all their varied progress and changes, in all their productions and attributes.

It will trace our race in all its successive emigrations, colonies, states, kingdoms and empires; from their first existence on the great, central, governing planet, or sun, called Kolob, until they are increased without number, and widely dispersed and transplanted from one planet to another, until occupying the very confines of infinitude ... ([Pratt 1915](#), p. 148).

Given these incredible visions, it is striking that this work is also considered to be a "great synthetic work", and is well regarded as an excellent piece of early Mormon religious commentary to the present day ([Givens 2012](#), p. xvii).

It is difficult to say across the board what the place of these nineteenth-century doctrines are in the twentieth and twenty-first century. Some Latter-day Saints took them quite seriously; some did not. The idea of a plurality of worlds is occasionally referenced in Church publications, usually as an example of a Mormon doctrinal concept proven accurate by science, suggesting a vindication of the Church's claim to truth; this is a line of apologetic argument that goes back to the early twentieth century (see, e.g., the book *Joseph Smith as Scientist*, [Widtsoe 1908](#), pp. 45, 150). More recent forms of

this argument have focused on the Drake equation, an astronomical formula designed to estimate the number of possible advanced technological civilizations that may exist at any given moment within our galaxy (see, e.g., Johnson 1970; Paul 1992, pp. 192–227).

On occasion, the doctrine of the plurality of worlds will be used to make a more interesting claim regarding the nature of extraterrestrial life. In 1971, *New Era*, a Church-operated magazine intended for a “youth” audience, published an article meant to dovetail on the excitement generated by the then-recent American Moon landing. In it, Kent Nielsen, a BYU Philosophy professor, noted that if there ever were contact with intelligent alien life, the Latter-day Saints as a community would be “at least partially prepared for such an event” due to its scriptural tradition. Because of this tradition,

[b]eing joint-heirs of all that the Father has, we may then look forward to using those powers to organize still other worlds from the unorganized matter that exists throughout boundless space. Creating other worlds, peopling them with our own eternal posterity, providing a savior for them, and making known to them the saving principles of the eternal gospel, that they may have the same experiences we are now having and be exalted with us in their turn—this is eternal life. (Nielsen 1971).

Given this, heaven has to not be read as some cloudy realm outside of space and time, but rather as *outer space*. As he says,

We do not know how extensive is the order of heavens that pertain to our Lord Jesus Christ and that were created by him. It may consist of the local group of stars to which our sun belongs, or of our whole galaxy, or of our cluster of galaxies, or of all of the galaxies we have so far discovered. (Nielsen 1971).

However extensive heaven is, though, one thing could be said about the aliens who might people it; they would not be the “green, bug-eyed monsters” of science fiction. Because they would be “of the race of Gods”, as we are, they would look like us:

There is nothing more fundamental in God’s revelations than the basic premise that we are of the race of Gods. We are of his species. God looks like us. We look like him. He has two arms, two legs, a head—indeed, Jesus said, “If ye have seen me, ye have seen the Father.” Obviously, God’s sons and daughters would be of his species, would resemble him. This was one of the basic truths Joseph Smith knew after his vision in 1820. Consequently, people on other worlds would be like us, because we are all his children. (Nielsen 1971).

This crowded cosmos was juxtaposed with the cramped world of “unbelievers”, such as Saint Augustine, who is presented as doubting that, if there was land “on the other side of world,” it could not be inhabited by “men.” (Nielsen 1971). Mormonism, in contrast, promises a far more expansive—and veridical—vision of the universe, Nielson suggests.

Nineteenth century scripture and speculation about Kolob has also been inherited in many different ways by later generations of Latter-day Saints. Both Kolob and the idea of a plurality of worlds are present in *Mormon Doctrine* (1958), a book written by McConkie (1958). At the time of its publishing, McConkie was a member of the “counsel of the seventies”, an important governing organ of the Church; he would go on to become an apostle, and even later, the First President of the Church. This text may seem authoritative until one learns that despite McConkie’s status, the book was never officially endorsed by the Church, and the first edition was officially criticized both for its astringent tone and for what were claimed to be numerous doctrinal errors. This did not mean that McConkie would cease endorsing Abrahamic Astronomy. In the 1980s, for instance, McConkie would again refer both to Kolob and the plurality of worlds in passing in a homilic essay on creation for *Ensign*, a Church-run periodical sent to effectively all of its members (McConkie 1982). The focus in that article was more on the idea that a day on Kolob, and hence a day for God, was one thousand years long; this allowed a more expansive reading of what a “day” meant in the Genesis account.

Kolob certainly has a place in more literalist aspects of Mormon, as shown by the work of W. Clene Skousen, a BYU Religion Professor and author of *The Naked Communist*, a book that was popular among conservative circles. Kolob makes its appearance in a different book that Skousen penned, *The First 2000 Years*, which presents itself as a history of “the first 2000 years of Human history—from Adam to Abraham” (Skousen 1997, p. iii). In it, relying on the prophetic authority of the third Church President John Taylor,⁷ Skousen states that Earth originated near Kolob and then traveled to its current position; Taylor is quoted as saying, “this earth which had fled and fallen from where it was organized near the planet Kolob” (Skousen 1997, p. 57). Skousen also suggests that after the resurrection, the earth would return to Kolob. (This is a claim that has been debated, tongue in cheek, once on the MTA Facebook group, where members argued about whether it would be geothermal heat or nuclear fusion that would heat the Earth during this long, cold galactic voyage through the vacuum of space.) Skousen went on to claim that Abrahamic astronomy is in harmony with contemporary scientific astronomy, and finally suggest that Kolob was most likely located within our galaxy.

There have even been efforts to be more approximate in situating Kolob. Lynn Hilton is a retired education professor from (as might be guessed at this point) BYU; he is perhaps best known for having led an archeological expedition to identify the spot where Lehi is supposed to have built his ship to sail to the new world. In his book *The Kolob Theorem* (1993), Hilton has argued for Kolob being situated in the center of the Milky Way, hidden behind a wall of interstellar gas and dust (which he refers to as a “veil”, an allusion to the barrier of forgetfulness that keeps humans from remembering their pre-mortal existence in Mormon cosmology). Parenthetically, BYU should not be taken as Kolob-obsessed; scholars in the astronomy department, for instance, were capable of writing educational material for a popular Church audience about much more sedate topics, such as the stellar main sequence (see, for example, McNamara 1968). However, this imaginative sobriety regarding astronomy was obviously not a universally held trait on that campus.

But Kolob was more than an object of religio-astronomic contemplation and theorizing. Kolob also has life as a metaphor. This metaphor has sometimes leaned into the astronomic side: a Princeton trained BYU astronomer, David Allred, has tried to explain the role played by the planet Jupiter’s gravity in stabilizing the orbits of the terrestrial planets, and also shielding the inner solar system from cometary bombardment, by describing the gas giant as “a type of Kolob” in our Solar System. (Allred 2007, p. 62). However, by a whole order of magnitude greater, Kolob is seen as a chiefly religious, and not a scientific, metaphor. As said in a Church-issued teacher’s manual designed to assist in children’s religious education, “Kolob . . . might also figuratively describe the greatness of Jesus Christ.” (Anon: 70). Then there is Kolob as a general piece of Mormon pop culture. It is incorporated into the title of a well-known, though somewhat difficult to sing, hymn, “If You Could Hie to Kolob”, or sometimes used as part of some salutation (I have heard of a Mission president’s wife whose closing words to departing missionaries would be “Love you to Kolob and back!”). Sometimes Kolob even is the punchline to a narrative; there is a story about some village-atheist type who tried to debate two Sister Missionaries he found on the street by asking “if God exists, where is he? Huh? Where does he exist?” only to have one of the missionaries, hoping to cut the interaction short, reply with tired exasperation, “Kolob. He lives on Kolob.” Kolob is also just an embarrassment for some, a piece of Mormon trivia that makes Joseph Smith sound like some crank. However, mostly, as one MTA member pointed out to me, the work Kolob does is impart a sense of wonder, to create something like a religion-inflected taste of the cosmic sublime. This is an aesthetic sensibility more than a cognitive proposition, of course, but that does not mean that it does not have effects as well.

Perhaps the chief example of this sense of cosmic religious wonder associated with Kolob can be found within Temple Square, the ten-acre space located right in the heart of Salt Lake City. Two of the most iconic buildings of the Church can be found on those grounds: the Salt Lake City Temple and the

⁷ Taylor was President of the Church from 1880 to 1887.

Salt Lake Tabernacle (the latter structure is home to the Tabernacle Choir at Temple Square, formerly known as the Mormon Tabernacle Choir),⁸ It is also home to one of the most iconic pieces of Mormon art. In Temple Square's North Visitor's Center, there is a replica of *Christus*, a nineteenth-century Dutch statue of Jesus with outstretched arms. Since the middle of the twentieth century, this statue has been used as one of the visual calling cards of the Church; an image of this statue appears as a Church emblem on websites and printed material, and much smaller replicas of this statue are available at Deseret Books, a chain of religious bookstores that (by way of a holding company) is owned by the Church. A gallery in the visitors' center is dedicated exclusively to the Christus statue; it is a large, round room that one reaches by ascending a long, curved ramp. The room holds several benches for those who wish to sit and contemplate the statue for a prolonged period. From time to time, a prerecorded first-person monologue "by" Jesus is played for people viewing the statue. On a small touch-screen panel near the exit, there are different settings for multiple languages—including languages such as Fijian or Finnish. There are also settings that allow different background music to be played that are labeled "Special Easter" and "Special Christmas"; at the one time I stayed in that room for a prolonged period, there were two sister missionaries whose job it was to select the appropriate language for viewers, and they delighted in my request to play numerous different languages just so I could hear them.

Additionally, behind as well as above the Christus statue is a large mural, a panorama that covers all of the chamber's curved wall, except for a window facing south towards the Temple, as well as the ceiling. That mural was painted in 1966 by a non-Mormon commissioned artist named Sidney E. King, and the painting is of outer space. That piece of art shows the planet earth, floating directly behind the *Christus* Jesus; other planets (such as Saturn and Mars) as well as some well-known astronomical objects (Andromeda, the Horsehead nebula) are also depicted. There are also stars there. The stars are painted so accurately that airline pilots have supposedly stated that they could use them to navigate by (Campbell 2017a). However, these stars and planets are positioned as they would have appeared in the Northern Hemisphere on a specific day—April 6th, 1830, the day that Joseph Smith formally founded the Church.

Art historian Campbell (2017b) has argued that this mural, called *Creation*, should be read as a space-age masculine, patriotic mural, since it was a part of a larger trend of space-themed American religious paintings of the period, which were an epiphenomenon of a mid-twentieth century religious interest in the "Space Race" (see, e.g., Osborne 2015). However, Campbell also notes that *Creation* is redolent of Mormon cosmology as well. The chief visual icon of the Church, located in the geographical heart of the contemporary Church of Jesus Christ of Latter-day Saints, *Creation* shows the degree to which religious awe and the cosmic sublime have been laminated together in mainstream Mormonism.

4. Conclusions: Speculative Religion and Recursive Time

Of course, even this sense of wonder has limits in its reception: one artistically inclined, non-MTA Mormon millennial-generation woman told me dismissively that she was never really into that much of the "planet stuff". Additionally, it would be wrong to think that Abrahamic Astronomy and Kolob form an intellectual straitjacket, a set of doctrines that all Mormon artists, authors, and scholars are obliged to follow. For example, when Matt Page, the author/artist of *Future Day Saints*, was asked about the planet/star from the Book of Abraham, he reluctantly admitted that since he believed God had a material body, he must believe that there is *something* like Kolob out there, but he was also quick to present this belief as a function of an existential commitment to his faith, stating that if he's going to believe something, he'll push his belief as far as he can go. At the same time, this commitment to the idea of Kolob did not prevent him from abandoning the doctrine that other members of what Nielson refer to as the "species of Gods" looked like humans. While *Future Day Saints* did present different

⁸ The reason for the name change can be found in footnote 1.

strains of *Homo Sapiens* who had traveled to New Eden from worlds independent of Earth, Page also signaled a desire for a more inclusive, multiracial Church by also adding to the roster of interplanetary immigrants several groups of wildly different, non-human aliens who also had been visited by Jesus after the resurrection. (Notably, on these non-human worlds, Jesus appeared in the form of whatever species of sentient life that was peculiar to each planet.) Like many other Mormon science fiction authors, for Page, Abrahamic astronomy is not a group of doctrines that he was locked into; it is instead an open-sourced set of tools to be used—or put aside—as needed for the artistic project at hand.

However, with all these qualifications, the influence that Abrahamic Astronomy has had in on Mormon Transhumanism and Mormon Speculative writing is still there. In this, there are anthropological lessons here about the importance of speculative religion. In anthropology, religion is often seen as either an issue of belief (Geertz 1966), even if belief is treated as a sometimes problematic category (See Lindquist and Coleman 2008), or an issue of institutional and embodied discipline (See, e.g., Hirschkind 2006; Mahmood 2011), even if this discipline must be counterbalanced with leniency (Mayblin and Malara 2018). Additionally, the Church of Jesus Christ of Latter-day Saints, with the centrality of “having a testimony”, and the importance of institutional oversight, certainly has elements that can be seen as falling into one of these categories or the other. However, while Kolob was obviously a matter of belief for some of those we looked at here, it was an object of speculation for others—a religious category that arguably falls outside of both discipline and belief, seeing how it is a kind of experimental thought and imagining that is carried out in the subjunctive mode. This essay, then, could be seen as a first step in writing the anthropology of religious speculation.

However, this also brings us back to our original anthropological question: what is necessary for there to be an imagined future? The combination of Abrahamic Astronomy and theosis suggests that a past can be useful in building a future. After all, French and American revolutionaries often used the language and visual icons of Republican Rome to communicate their ambitions and ethics. However, the case at hand suggests that when it comes to thinking through the true alterity of outer space, it cannot be *any kind of past*. It must be a recursive or fractal kind of past, where the past can also be kind of future. After all, the core of Mormon doctrine, at least as interpreted by these groups, is that the past is also a kind of future, and that the tale of how God overcame his humanity and became God so as to craft the present corner of the universe is also the tale of how, through either spiritual exercise or religiously inspired technological mastery, future humans will also achieve theosis and perform the same work of creation. (This imagination of space exploration as a return to already existing cosmic progenitors is what disassociate this fantasy from the usual settler-society taint rooted that is in the history of the dispossession of indigenous lands – such as, ironically, what was done by 19th century Mormon settlers in the Utah Territory.) Imagining what a secular version of this vision would be like, of course, is a harder problem; it may be that the intellectual material needed to craft this sort of intellectual framework is absent, or the aesthetics and sensibilities of secularism somehow preclude it. However, we cannot know until the work of producing such an imagining has truly begun.

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Article

Eternity in Low Earth Orbit: Icons on the International Space Station

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Abstract: This paper investigates the material culture of icons on the International Space Station as part of a complex web of interactions between cosmonauts and the Russian Orthodox Church, reflecting contemporary terrestrial political and social affairs. An analysis of photographs from the International Space Station (ISS) demonstrated that a particular area of the Zvezda module is used for the display of icons, both Orthodox and secular, including the Mother of God of Kazan and Yuri Gagarin. The Orthodox icons are frequently sent to space and returned to Earth at the request of church clerics. In this process, the icons become part of an economy of belief that spans Earth and space. This practice stands in contrast to the prohibition against displaying political/religious imagery in the U.S.-controlled modules of ISS. The icons mark certain areas of ISS as bounded sacred spaces or hierotopies, separated from the limitless outer space beyond the space station walls.

Keywords: International Space Station; iconography; hierotopy; material culture; sacred space; cosmonaut

1. Introduction

How the perspective of being outside the world—that is, in space—changes personal approaches to spirituality among space travelers has been the subject of numerous studies (e.g., [Suedfeld 2006](#); [Weibel 2016, 2020](#); [Weibel and Swanson 2006](#)). Accounts of the “overview effect” attest to its powerful impact on individuals who experience it ([White 1987](#)). This phenomenon has become a marker of space culture, an elite experience available only to the fewer than 600 humans who have ever ventured beyond Earth. However, religious practices are also manifested in more mundane ways inside space stations, including the International Space Station (ISS). The display of icons among other imagery on the walls of the Zvezda module, in the Russian Orbital Segment of ISS, represents a conscious effort to imbue certain physical spaces with the qualities of terrestrial sacred spaces familiar to Orthodox believers. Moreover, the passage of icons between Earth and the Zvezda module shows an entanglement of cosmonauts’ personal beliefs with terrestrial political agendas.

The International Space Station Archaeological Project began in 2015 as the first comprehensive study of the material culture of a human habitat in space. For the last twenty years, ISS has been the only permanent human occupation of space. The first module, Zarya, was launched in 1998, and the station now consists of 16 modules from Russia, the United States, Japan, and the European Space Agency. The Russian service module Zvezda (“Star”) was launched in 2000. It contains key life support systems for the Russian crew and a docking station for Soyuz and Progress spacecraft.

Since we are unable to travel to the site to make observations in person, we have developed innovative methods to study the culture of ISS ([Walsh and Gorman 2020](#)). Chief among these is the examination of historic photographs. NASA maintains an archive of hundreds of thousands of images spanning the entire twenty-year occupation of the space station to date, including from the Russian

Orbital Segment of which Zvezda is the main component. A sample of these images has been made available to the public through the agency's Flickr page (<https://www.flickr.com/photos/nasa2explore/>). These photographs are "born digital" and therefore have associated metadata giving the time and date of their creation. Arranging them in chronological order allows changes in the configuration and function of various spaces over time to be tracked.

The evidence in this article is a series of 48 photographs taken in Zvezda between 2000 and 2014. These images show that crew members adorned the module's aft wall with various items, including flags, mission patches, photos, paintings (landscapes, churches, and icons of saints), relics, religious symbols, and toys. The purposeful display of objects, especially images, in Zvezda is the continuation of a phenomenon that can be observed in Russian space stations at least since Salyut 5 in 1976 and developed through Salyut 6, Salyut 7, and Mir (Walsh et al., forthcoming). The kinds of images displayed vary from expedition to expedition, reflecting the evolution of contemporary Russian terrestrial culture—for example, in the transition from Soviet to Orthodox and nationalist symbols at the time of the collapse of the Soviet Union in 1991. The launch of icons specifically, and their return to Earth, is often documented by Russian news media, allowing us to track the dynamic nature of the Zvezda display. This display reveals the interplay between personal and institutional, even state-sponsored, expressions of faith, exemplified by the variable function of the aft wall as an "icon corner" of the kind found in adherent Russian domestic spaces; or an iconostasis, an integral part of Orthodox churches.

2. Defining Hierotopy

The concept of *hierotopy*, first developed by Alexei Lidov in 2001, is a method to recognize and evaluate the special connotative nature of religious spaces and how they are brought into being by human action. Although the concept of hierotopy is applicable across all cultures and times, Lidov has focused on the "spatial icons" of Byzantium and early Russian Orthodoxy. It seems particularly apt for the framing of Russian activity on ISS, where "space icons" have come to occupy a central place.

In Lidov's formulation, hierotopy refers to the formal construction of a sacred space. It is the product of deliberate action imbued with abstract, performative, and creative (though not necessarily "aesthetic") qualities, as well as tangible, "object-centered" ones. Hierotopy goes beyond the mere conceptualization or recognition of a space as having sacred qualities or the initial "divine inspiration" to articulate the space by means of structures, images, or holy objects; both of these aspects fall instead under the rubric of *hierophany*, a necessary preliminary stage to hierotopy. Key components of a hierotopy include the topographical definition of a space—demarcation of its boundaries—that is recognized as symbolically distinctive within a religious belief system; the arrangement of the structural components and/or their decoration; and the performance of specific activities (whether repeated or unique). All of these components together work to reify and activate the sacred nature of the space (Lidov 2006).

The behaviors of cosmonauts, in traveling to receive icons as part of terrestrial ceremonies at Orthodox churches, bringing them to ISS, arranging them on display in various configurations, producing photographs and videos to document and broadcast the icons, and then returning them to Earth, seem to be a clear example of hierotopic practice. From the very first Expedition (or group of crew) in November 2000, the aft wall of the Zvezda module was a locus for the display of icons. A small icon of Saint Theodor of Tiron was placed "high" on the wall in a central position between two gray fuse boxes and two red vent covers¹.

¹ The microgravity environment of ISS means that there is neither "up" nor "down". However, the Zvezda module was designed with a two-tone color system to help the crew orient themselves, with olive green surfaces on the side facing toward Earth (nadir) and beige surfaces on the walls and the side of the module facing away from Earth (zenith). The consistent orientation of the photographs, as well as the orientation of the items displayed on the wall, indicates that crew members

A photograph of Sergei Krikalev exercising before the aft wall shows that the placement of the icon visibly transformed an area whose use was otherwise indistinguishable from others in the module, with equipment and electrical cords randomly scattered about (Figure 1). Krikalev and Yuri Gidzenko, the two Expedition 1 cosmonauts, had both served on Mir and so were continuing a practice of visual display that had developed on previous Soviet-Russian space stations (Walsh et al., forthcoming). On subsequent expeditions, the upper part of the aft wall continued to be the location where most icons were placed, often with a gold or gilt Orthodox cross. At various times, icons of the Mother of God with Child, Christ Pantocrator, Saint Nicholas, and Saint Sergius of Radonezh were placed, alone or together, on the wall. The Kazan Mother of God appeared most frequently, in 25 of the 48 photographs. A small painting of the cathedral at the Troitse-Sergieva Lavra, one of Orthodox Russia's most important monastic centers with close ties to Russia's space program, often appeared off to one side, especially in the first decade of Zvezda's occupation. In a set-back area below, which we refer to as the "niche," portraits of the Soviet space heroes Yuri Gagarin (the first human to orbit Earth in 1961), Konstantin Tsiolkovsky (the "father of rocket science"), and Sergei Korolev (the original leader of the Soviet space program) were placed, joined occasionally by icons, copies of the New Testament, and the golden cross mentioned above (Figure 2).



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Figure 1. The Zvezda module in 2000, showing an icon of Saint Theodor of Tiron.

tend to treat nadir as "down" and zenith as "up". Our use of directional descriptors in this article, including "high" and "low", reflect this convention.



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Figure 2. The space heroes Konstantin Tsiolkovsky and Yuri Gagarin displayed in the “niche” of Zvezda’s aft wall.

Zvezda was not designed to accommodate icon displays. There are no obvious cues from the architecture of the space to indicate that this is an appropriate or desirable place to display sacred images, nor are there visible frames or fasteners. However, the inherent symmetry and centrality of the aft wall’s design—properties that made it an effective backdrop for photo documentation and broadcasts back to Earth—also marked it out as a potential locus for creating a hierotopy within Zvezda’s cramped multipurpose space. The selection of this part of the wall to mirror the public/private display of icons, in emulation of Russian churches and homes, is likely to have been a crew choice reflecting not only long-standing cultural traditions but also changes in post-Soviet society. Just as terrestrial icons began to actively circulate through pilgrimages, processions, and rituals of healing and blessing after the fall of Communism, so, too, the constant changing of images in Zvezda shows them to be replicating these participatory rituals, while also introducing a new element: the conferral of sacred aura upon icons that performed the feat (*podvig*) of a journey to space and back, thus undergoing a sort of rite of passage before returning to Earth. The photographs taken on Zvezda show how a sacred space has been imprinted on a technological surface, transforming the space around it by association. It is what Lidov calls a dynamic hierotopy, “adapting its elements according to an individual’s perception—some aspects of the spatial entity could be accentuated or temporarily downplayed” (Lidov 2014, p. 78). Positioned on the threshold between outer space and the environment of Zvezda, and continually responding to pressures from terrestrial communities and authorities, the display of icons in the niche can be seen to act as “a kind of pivot in forming a concrete spatial environment” (Lidov 2014, p. 63).

3. Terrestrial Politics and Celestial Artifacts

The complex nature of post-Soviet church-state relations and their extension into outer space is central to understanding the dynamic presence of icons on ISS and the extent to which they have

served to create a hierotopy². With the fall of the Soviet Union in 1991, a series of collaborations between the Russian space agency Roscosmos and the Patriarchate of the Orthodox Church signaled a reversal of the atheist rhetoric that had characterized the Soviet conquest of space since Gagarin's mission in 1961. Typical of that rhetoric was the new exhibit developed by Leningrad's Museum of the History of Atheism and Religion, housed in the former Kazan Cathedral, immediately following the mission. Titled "Soviet People Conquer Space," it featured sections on Tsiolkovsky, Sputnik, and Gagarin. "Religion taught that man is an 'earthworm' and cannot fly 'like an angel'," the museum didactics read. "Science has realized the dream of people to conquer the element of air. It was not a 'divine miracle,' but bold thinking and inspired labor that gave man mighty wings to vanquish space and time" (Nauka i religiiia 1961, p. 85). In the state-run museums which opened to celebrate the Space Age in the Soviet era, the three space heroes presented a master narrative of "technocratic progress, social harmony and national enlightenment" (Siddiqi 2005, p. 101).

Three decades later, the juxtaposition of the three space heroes' portraits with icons on Russian modules created a visual counter-argument that science and faith were compatible. Rumors circulated that Gagarin was a believer, with proponents pointing to his pre-flight visits to the Troitse-Sergieva Lavra (Petrov 2013). Interviews with cosmonauts revealed that a number of them had been believers even³ in the Soviet period. Patriarch Alexy II, head of the Russian Orthodox Church from 1990 to 2008, was a key figure in institutionalizing these changes. As the first patriarch to serve after the fall of Communism, Alexy II faced the task of restoring a church badly damaged during the Soviet years. His tenure was committed to normalizing relations between secular and religious spheres and to fostering global peace initiatives, while also taking a hard line on other faiths suspected of trying to make converts among the Orthodox. During his patriarchate close ties were forged between Roscosmos and the Orthodox Church, resulting in the first of many officially sanctioned transports of icons into orbit.

In July 1995, as part of "Project Anastasia—The Hope of Peace," two print icons of Saint Anastasia, one Orthodox, the other Roman Catholic, were sent with the Patriarch's blessing "on a peace mission" to the Mir station (*mir* meaning both "peace" and "world" in Russian). Venerated as a protector against wars between nations and a saint common to both East and West, Anastasia represented an extension of the Soviet space program's official rhetoric of leading the family of nations toward world peace. The two icons appear in a photo of the Russian cosmonauts Gidzenko and Adveev and European Astronaut Corps (ESA) astronaut Reiter in the Mir Core Module, on either side of the photo of Gagarin in his space helmet (Figure 3).

² For a detailed account of the Orthodox Church's active engagement with the Russian nuclear and military complex, see (Adamsky 2019).

³ For instance, Yuri Lonchakov commented, "Some people are amazed that cosmonauts believe in God. It's the Soviet stereotypes at work. But we are ordinary people, if earlier we had to conceal our faith, today we can talk about it openly", <https://foma.ru/yurij-lonchakov-otkryityj-kosmos.html> (accessed on 10 October 2020).

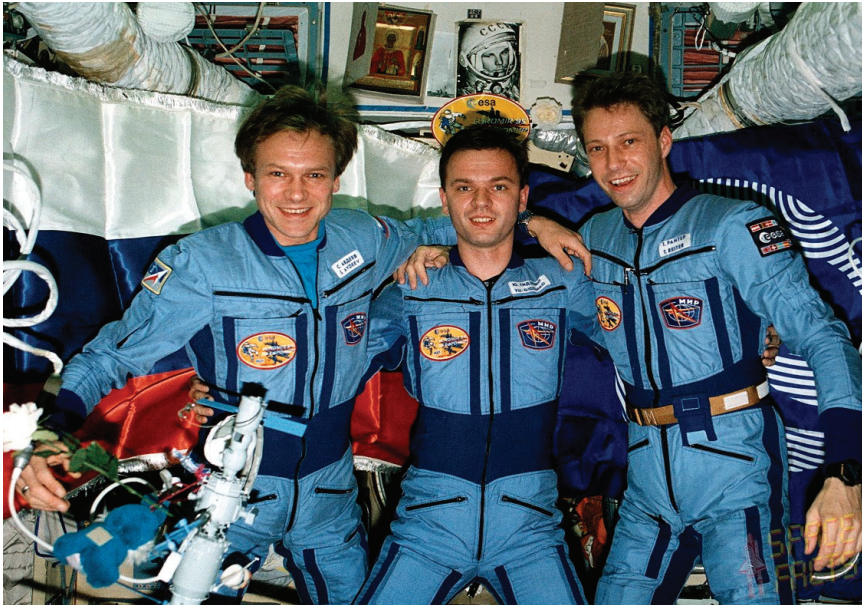


Figure 3. The icons of Project Anastasia on the Mir TM-22 mission.

The symmetry of the composition stresses the importance of the moment, as the three men enact a ritual of international cooperation in a space sanctified by the icons' presence. It also affirms the exceptional significance of Gagarin's image as one of continuity between old and new regimes. Even the placement of the "EuroMir 95" mission patch, directly lined up with Gagarin and Gidzenko's heads, conveys a quasi-hieratic meaning to the moment. In this image from Mir, and in all subsequent arrangements of Gagarin's image on ISS, a new layer of meaning was thus added to the single, unambiguous atheist reading possible before 1991. As for the two icons, they returned to Earth after seven months and were taken on a pilgrimage to the places associated with Saint Anastasia in Europe. Imbued with a new spiritual power by their exposure to a divinely created cosmos, these icons established an important precedent in the cult of space-flown objects.

This official gesture by the Patriarch may have emboldened crewmembers to add their own icons to the spot where the patriarchal visitors had been⁴. Between 1996 (Mir-22) and 1997 (Mir-23), a tiny icon most likely of St. Nicholas appeared on the aft wall, perhaps brought by the commander, Vasily Tsibliev. Later that year (Mir-24) a second icon of the Mother of God was added. Even so, there was still a certain degree of informality in the way images were organized in and around the niche. In a 1998 photo, images of Gagarin and Tsiolkovsky occupy the niche, while just outside it on the wall to the right is a calendar with an icon of Christ on the cover. Another photo shows an icon calendar in close proximity to an upturned vodka bottle and a stuffed toy. The presence of icons did not erase the space's domestic and recreational functions, emphasizing a point of commonality with the domestic "icon corner".

⁴ According to Adamsky (2019, pp. 64–65), in 1994, Valery Poliakov took his own small icon of the Kazan Mother of God into space, and since the beginning of Project Anastasia, it has become regular practice among the cosmonauts to bring personally meaningful icons.

While the first icon appeared on ISS in November 2000, the practice of bringing icons into space became especially visible in 2004⁵. The ecumenism exhibited by the official inclusion of the Roman Catholic icon of Saint Anastasia on Mir did not last. That year, the renewed importance of icons in national life was made clear by the high-profile return to Russia of a revered icon of the Kazan Mother of God that had been smuggled out of the country during the 1917 Revolution and acquired by the Catholic Church. The Patriarch had rebuffed Pope John Paul II's efforts to return the icon in person, and the episode of its eventual return was considered a victory for Russian religious and patriotic feelings (Allen 2004). Anti-Catholic sentiments were running high, as the Western church attempted to leverage the overturn of state-sanctioned atheism to expand its foothold in Russia (Balzer 2010, p. xv). Just six weeks later, a copy of the Kazan icon, together with an icon of the Archangel Michael, was sent to the station on Soyuz TMA-5, evidently on the initiative of the head of Roscosmos, Anatoly Perminov (Novikova 2004). Then in early December, Perminov requested an audience with the Patriarch to discuss what part ISS might play in the country's preparations for the celebration of the sixtieth anniversary of Victory Day in 2005; also under discussion was the church's role in plans to mark the Baikonur cosmodrome's fiftieth anniversary that June. During the meeting, Perminov presented the Patriarch with the Kazan and Michael icons that had just returned from space. In doing so he established a new role for "space icons" in national life, building on patriotic narratives that had particular meaning for Russians in 2005. As Perminov asserted,

[T]he icon that has been in space will become a splendid and cherished gift for the true patriot and citizen marking this important event. Already the icons of the Kazan Mother of God and the Archangel Michael, after many times orbiting our planet, which has turned out to be so defenseless, will come to reflect the combination of traditional spiritual symbols and contemporary achievements in the field of space exploration. (Novikova 2004)

Perminov's initiatives suggest that he understood the growing political power of the church as an arm of the state, and the unprecedented role religious imagery would play in the upcoming commemorative celebrations and in public life more generally. He also alludes to the icons creating a protective circle around the "defenseless" planet, and by this feat partaking of the mystique of the cosmonaut. With this rite of passage, identical to Yuri Gagarin's, the icons were able to represent (and reconcile) both traditional spirituality and contemporary technology.

During 2005–2006, Orthodox imagery was especially visible on ISS, and there were noticeable efforts to create new traditions linking the Church and space. Taking icons to ISS became a new form of *krestnyi khod* (cross procession), the Orthodox tradition of taking icons and sacred relics on a procession at Easter and other solemn occasions. In 2005, Sergei Krikalev circled Earth more than 1000 times onboard ISS, together with an icon of the Valaam Mother of God (Valaam 2006). This icon was associated with an Orthodox monastery on the island of Valaam in the province of Karelia, which had been contested territory over several centuries. Miracle-working powers were attributed to the image dispatched to ISS with the Patriarch's blessing: first when the crew survived a sudden drop in air pressure, and again on the icon's return to earth when its colors were perceived to have grown brighter. As the abbot of Valaam Monastery explained, "in our era this tradition [of the cross procession] takes on new forms: we are meeting an icon that has completed an even more unusual procession. . . . we are seeing the dismantling of the artificial barriers that had been created between the Church, believers of different nationalities in our country, and science, particularly cosmonautics" (Kosmicheskii krestnyi khod s Valaamskoi ikonoi Presviatoi Bogoroditsy 2015).

Fostering traditions linking the church and ISS continued with an initiative called "Easter in Cosmic Space": in 2005 the Patriarch sent Easter blessings to ISS, stressing that this practice dated back

⁵ It is worth noting that in this early period of ISS habitation (from its beginning in 2000 until late 2008), Zvezda was the only location for permanent crew berths and that only mixed Russian-U.S. crews lived on the station.

to the Mir station in 1995 (FOMA 2015). At Christmas services in January 2006 in Moscow's Cathedral of Christ the Savior, he informed the congregation that "the commander of the space station told him that he always wore his silver cross and that it helped him to get his job done" (Interfax 2006). And in March 2006, Alexy II gave Perminov a large gold cross, four more icons, and a New Testament, which were delivered to the station by the crew of Soyuz TMA-8. These objects are the icons and cross that feature most often in photos of the aft wall in subsequent years—Zvezda's "home icons," so to speak. Sometimes a photo or drawing of the Troitse-Sergieva Lavra near Moscow was added to the display.

A second wave of icons dispatched to ISS on short-term sojourns began in January 2008, when the Patriarch and Perminov met again to discuss future joint projects. The publicity and marketing potential of such a collaboration was also evident on the agenda, for the two men were joined by representatives of the Roscosmos TV studio and the cultural fund of the "Orthodox Encyclopedia" TV channel (Roscosmos TV Studio 2008). Perhaps this meeting marked the beginning of a more carefully scripted and "curated" presentation of ISS, one in which the aft wall would serve as a visual barometer reflecting events on Earth.

Father Iov Talats, the rector of the Cathedral of the Transfiguration in Star City (location of the Russian space agency's cosmonaut training facilities), played a central role in these initiatives⁶. Since 2007, Father Iov has acted as a spiritual mentor to a group of cosmonauts that includes ISS crew members Yuri Lonchakov, Fedor Yurchikhin, Alexander Samokutiaev, Valery Korzun, and Pavel Popovich (Lev 2013). In 2006, Father Iov continued a tradition, purportedly going back to Gagarin, of blessing cosmonauts at the Troitse-Sergieva Lavra before their departure. In 2008, he initiated a campaign to send holy relics into space in the care of his cosmonaut flock⁷. A common thread in these actions was the renewed cult of national saints associated with the idea of Holy Rus (Russia's unique history and mission as a Christian people) and with state building—a message quite distinct from the international peacemaking mission of Saint Anastasia in 1995.

The cult of relics and the traditions of pilgrimage and processions involving icons that were revived in the post-Soviet era were thus very consciously extended out into space. There is also a degree of missionary zeal in these activities, establishing Zvezda as an outpost of the Orthodox Church. More broadly, they can be seen as part of a process whereby cosmonaut traditions developed in the Soviet years were replaced by or augmented with new ones borrowed from church rituals and with strong nationalist themes⁸.

Roscosmos has intermittently used social media to acknowledge and normalize the presence of "religious symbols" on ISS. In this regard, the aft wall has played a central role in articulating a space that speaks directly to the intimate link between Orthodox faith, patriotism, and nation-building in post-Soviet Russia. Maksim Suraev's online diary, launched in October 2009 at the suggestion of Roscosmos's press agency, included a shot of the aft wall with the Kazan Mother of God and a small St. Nicholas icon sharing the space with the three space heroes. Other photos show the Patriarch's cross with an icon of Christ Pantocrator. As for his personal effects, Suraev wrote that he kept in his

⁶ On Father Iov, see (Adamsky 2019, pp. 138–41).

⁷ The first of these was a relic of Saint Sergius of Radonezh, which Yuri Lonchakov took into orbit for six months, twice carrying it out on a space walk and, at Father Iov's instruction, "periodically bless[ing] the Earth" with it. In 2010, Fedor Yurchikhin took relics of Saints Fedor Stratilat and Fedor Tiron, together with a piece of the wood in which Saint Nicholas's remains were kept when they were transferred to Bari. Anton Shkaplerov took the relics of the Moscow Metropolitans Peter and Philip, Maksim Suraev had a piece of the True Cross, and Sergei Volkov the relics of Afanasy (Sakharov) Kovrovsky, a newly canonized saint who had been a victim of Stalinist purges. In 2013, Fedor Yurchikhin took up a relic of Saint George the Victorious, worn on a chain around his neck, and in 2016 a box containing a tiny relic of Saint Serafim of Sarov was strapped to the chest of Sergei Ryzhikov (Coalson and Palveleva 2016). On its return the relic was presented to the Star City Cathedral. (<https://www.pravmir.ru/osoboe-poslushanie-apostolskoe/>).

⁸ Valery Riumin, who flew three long-duration missions on Salyut 6 in 1977, 1979, and 1980, recalls some of the Soviet rituals in his memoirs. They included an exchange of greetings with Red Square on May 1, during the International Workers Day parade, and a visit to Lenin's apartment before each flight (Riumin 1987, p. 5). Gagarin himself emphasized the new tradition of pledging to fulfill the assigned task at Lenin's mausoleum before each flight, <https://foma.ru/pervyj-kosmonavt-o-razrushenii-xrama-xrista-spasitelya.html>.

berth a cross with a relic of the True Cross, given to him by Father Iov at Baikonur and blessed at the Troitse-Sergieva Lavra (Suraev 2009). Even when icons and relics have been temporarily absent from the “official” wall (as seems to be the case, for instance, since sometime in 2017), news reports document a steady stream of icons visiting ISS, typically sent by the abbot or abbess of a monastery or the congregation of a church. Photos of these icons are sometimes taken at the large porthole in Zvezda’s floor, or in the middle of the module, where they are posed floating free in space without human presence (Figures 4 and 5). Commentary posted on Orthodox sites focuses on the revelation of God’s presence in the contemplation of cosmic infinity. This placement seems to deliberately enhance the icon’s “reverse perspective,” a convention in icon painting which is little used in post-Renaissance art, and through this, the qualities of eternity and infinity. As Antonova (2009, p. 2) argues, the viewer’s perception of the icon “can be compared to the ‘vision’ of God, who exists beyond time and to whom, therefore, all aspects of the objects in the world would appear at once, simultaneously.” In the context of ISS, this is neither overview (White 1987) nor ultraview (Weibel 2020) but a divine view mediated by the physical presence of the icon against the backdrop of limitless space outside.



Figure 4. Icon of Christ Pantocrator and gold cross floating in front of the front hatch of Zvezda.

The transport of sacred imagery to and from ISS has continued since Alexy II’s death in 2008, under his successor, Patriarch Kirill. In September 2009, Kirill blessed an icon of the Mother of God of the Sign, which went up aboard Soyuz TMA-16, remaining in orbit for 12 days (Krestnyi khod 2009). On occasion, photos taken on ISS seem to reflect a commercial dimension to the new tradition of “space icons,” or at least to mirror the business aspect of icon production in contemporary Russian life. In January 2011, cosmonaut Aleksandr Kaleri was shown with three identical silver icons of the Kazan Mother of God. These were made by Aleksandr Provotorov, a member of the “Trinity” Association of Orthodox Sculptors and the initiator of a project called “A new weapon of Russians in space” (Sergii 2015). In April 2013, an online interview with Father Iov included a photo of Yuri

Lonchakov at the porthole holding up three sets of identical color-printed images of icons of Saint Nicholas and selected saints (Figure 6)⁹.



Figure 5. Icon of the Mother of God of the Sign with Earth in the background.



Figure 6. Cosmonaut Yuri Lonchakov with printed icons.

⁹ <http://zvezdnyi.moseparh.ru/files/2016/10/111164.p.jpg>.

In both cases, the inference seems to be that the spiritual power of even mechanically produced icons is enhanced by their sojourn in space. Here, too, there is a revival of pre-revolutionary pilgrimage practices, where souvenir icons (frequently printed on tin or paper) gained immeasurably in sacred value when blessed at the shrine of a saint (Chulos 2012). News reports on such occasions emphasize the number of days each icon or relic is in space and the number of times it orbits Earth, conveying a sense of endurance, of performing spiritual and physical feats in the name of faith (Relics 216). In this sense, the icons take on qualities of the cosmonauts in enduring the rigors of space.

The presence of icons on ISS took on a more political and patriotic edge with the Russian annexation of the Ukrainian territory of Crimea in February–March 2014. On July 19 of that year, Maksim Suraev, Aleksandr Skvortsov, and Oleg Artemyev celebrated the seven-hundredth anniversary of the birth of Saint Sergius of Radonezh—one of Russia’s earliest and most venerated monastic saints—with a broadcast showing them in the front end of Zvezda, holding icons of the saint (Figure 7)¹⁰. More icons hung behind them, some relocated from the aft wall, others, like the triptych of the Old Testament Trinity, clearly brought up from Earth for the occasion. The patriotic overtones of the event were heightened by the loops of orange-and-black Saint George ribbons on each cosmonaut’s chest; the ribbon was an Imperial-era award for military valor that had been reactivated in post-Soviet Russia, particularly in commemorating the Great Patriotic War, as Russians call World War II. This celebration of national pride in space led to terrestrial controversy. A photograph of the scene, tweeted by Artemyev, generated some online backlash questioning the appropriateness of holding a religious celebration on ISS.



Figure 7. Cosmonauts in Zvezda, 2014, with icons of Saint Sergius of Radonezh.

The tweeted photograph was subsequently removed and replaced by an image showing the same crew members with memorabilia celebrating Soyuz-Apollo. One Ukrainian media site tweeted a doctored version of the original image that showed all of the interior surfaces of the space station

¹⁰ All four Expeditions to ISS in 2014 brought with them icons of Saint Sergius (Iz Lavry k tret'emu miru 2015).

covered by icons and the cosmonauts given the beards and halos of Orthodox saints (Figure 8)¹¹. While politically motivated (note the blossoming of Saint George ribbons on the cosmonauts' uniforms), the meme demonstrated a certain understanding of how the closely shared space of the hierotopy transforms bodies. The icons become cosmonauts, the cosmonauts become saints.



Шкварки News

@ShkvarkiUA

Follow

Replying to @Voproskin

Осталось совсем малость до такого
[@Voproskin](#) [@Anna_Mambyk](#)

Translated from Russian by bing

Very little, until such [@Voproskin](#) [@Anna_Mambyk](#)



9:46 AM - 29 Nov 2014

Figure 8. A parody of Figure 7, produced by an unknown Twitter user.

4. Synthesis

The Russians' treatment of their space on ISS has been distinct from that of other nations housed there. No overtly religious images or symbols are on display in any other part of the station. The images and objects displayed in the Zvezda niche are both symbolic and material, contributing to the creation of a shared spiritual and social experience for the cosmonauts on ISS and reflecting deep connections to contemporary political and religious life in Russia that are most likely opaque to any but them

¹¹ The Twitter account @ShkvarkiUA was deactivated and the media site deleted at some point subsequent to 2014. The tweet we captured was made in response to one by @Voproskin (<https://twitter.com/Voproskin/status/538740093981577216>) which commented on the "iconostasis".

and their fellow Russians. Their outward, secular meaning for non-Russian (overwhelmingly U.S. and western European) crew is different from the inner, initiated meaning they hold for Russian crew, whatever their personal beliefs.

Soviet public life was saturated with ideology in every corner, and Soviet space modules replicated that with images of Lenin and other Soviet leaders among other cultural artifacts. Now that official atheism has been replaced by a strong Orthodox presence in post-Soviet Russia, the same degree of intrusion or visibility is still present on ISS, one that associates the icon with a uniquely Russian identity. The cosmonauts use the aft wall of their living space to reinforce messages for themselves as cosmonauts and Orthodox Christians, as well as making it the ever-changing backdrop for the visual messages they send back to Earth. Our findings suggest that symbolic displays once dictated by the Communist Party are now orchestrated by the Russian Orthodox Church in tandem with Roscosmos and with the cooperation of individual cosmonauts.

Russian cosmonauts have adopted recognizable patterns of display on the aft wall of Zvezda in ways that both rehabilitate icons into public life and integrate the secular space heroes into a broader symbolic field. Photos of Yuri Gagarin in a space helmet and military uniform had been fixtures of earlier space stations before ISS but apparently without a fixed location; instead, they moved about the space, tucked in among an assortment of other images and objects. It was not until ISS Expedition 4 that his photo appeared in the area above the niche along with that of Tsiolkovsky, while the famous photo of Gagarin holding a dove of peace was added to the wall in Expedition 5. Korolev first appeared together with Gagarin on Expedition 28 in January 2011. The elevation of the three men to an honorific location in the niche (sometimes drifting to the tier above) recalls the Walls of Honor (*Doska pocheta*) so familiar in the Soviet landscape—public displays of the portraits of war heroes, Party leaders, and exceptional citizens (Figure 9). Grouped together as the ancestors of all Soviet cosmonauts, they echo another secular Trinity that Soviet citizens would have instantly recognized: that of Marx, Engels, and Lenin (Thomas 2010). This trinitarian theme has taken on new inflections as icons have appeared alongside the space heroes in the niche of ISS, synthesizing and reconciling the Soviet past with a present where the marking of sacred space has become a matter of state importance.



Figure 9. An “Honour Wall” in Zvezda.

Dmitri Adamsky has shown how the Russian Orthodox Church has integrated itself into national institutions that are connected to the concept of a “Greater Russia,” including nuclear military forces and the cosmonaut corps (Adamsky 2019). The sending of icons and other religious items to ISS reflects those institutional efforts, as well as the high number of Orthodox believers reported among cosmonauts. In this way, the display of religious items seems to track changes in terrestrial Russian society and culture, particularly at times of national patriotic events (V-E Day commemorations) or heightened military-political activity or stress (the 2008 conflict in Southern Ossetia, the 2014 annexation of Crimea). At the same time, the display of icons forms a distinct part of Russian space culture in the post-Soviet era. Beginning at least with Salyut 5 in 1977 and continuing through the other two Salyut stations and Mir, political and cultural secular images were regularly used to create a recognizably domestic Russian area in the part of the space station where cosmonauts spent most of their lives.

ISS combines what in terrestrial architecture tend to be separate buildings or spaces: domestic, workplace, private, public, laboratory, gymnasium, television studio, cargo hold, etc. (Figure 10). None of the segments were designed to incorporate the functions of worship or to cater to individual religious beliefs. Thus the creation of a hierotopic space on the aft wall of Zvezda has required cooperation between the crew, who willingly transport icons and other religious objects back and forth, Roscosmos, which must authorize and document every item allowed on board, and the church hierarchy on the ground, who orchestrate what is represented and when, in accordance with the liturgical calendar as well as events occurring in the geopolitical sphere. The placement and change of items over time as seen in the images analyzed is ad hoc, in the sense that the process does not follow a clear order, but also organized, in that certain types of objects seem to be clustered in various locations.



Figure 10. Sacred space in the International Space Station.

What makes the display and performances in Zvezda unique is the conflation of three usually distinct forms of hierotopy: the domestic icon corner and the public-facing iconostasis of an Orthodox church, the performance of sacred rituals in which icons play an active role, and the secular veneration of space heroes in museums. The appearance of icons, relics, religious books, and crosses in the photo database is the static record of a dynamic culture of religious observance that appears to be evolving on

ISS. It has become a place that replicates some of the hierotopic functions of icons on Earth, including pilgrimages and cross processions, blessing the community of the faithful, and celebrating saint's days. This affirms the Orthodox belief that icons are filled with divine agency and act as intermediaries or portals connecting the mundane space of Earth with the Divine cosmos.

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Article

The Overview Effect and the Ultraview Effect: How Extreme Experiences in/of Outer Space Influence Religious Beliefs in Astronauts

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Abstract: This paper, based mainly on astronauts’ first-person writings, historical documents, and my own ethnographic interviews with nine astronauts conducted between 2004 and 2020, explores how encountering the earth and other celestial objects in ways never before experienced by human beings has influenced some astronauts’ cosmological understandings. Following the work of Timothy Morton, the earth and other heavenly bodies can be understood as “hyperobjects”, entities that are distributed across time and space in ways that make them difficult for human beings to accurately understand, but whose existence is becoming increasingly detectable to us. Astronauts in outer space are able to perceive celestial objects from vantages literally unavailable on earth, which has often (but not always) had a profound influence on their understandings of humanity, life, and the universe itself. Frank White’s term, the “overview effect”, describes a cognitive shift resulting from seeing the Earth from space that increases some astronauts’ sense of connection to humanity, God, or other powerful forces. Following NASA convention (NASA Style Guide, 2012), I will capitalize both Earth and Moon, but will leave all quotations in their original style. The “ultraview effect” is a term I introduce here to describe the parallel experience of viewing the Milky Way galaxy from the Moon’s orbit (a view described reverently by one respondent as a “something I was not ready for”) that can result in strong convictions about the prevalence of life in the universe or even unorthodox beliefs about the origins of humanity. I will compare Morton’s ideas about humanity’s increased awareness of hyperobjects with Joye and Verpooten’s work on awe in response to “bigness”, tying both to astronauts’ lived experiences in order to demonstrate the usefulness of ethnographic data in this context, discuss how human experiences in outer space might influence religious practices and beliefs, and suggest that encounters with hyperobjects hold the potential to be socially beneficial.

Keywords: anthropology; religion; spaceflight; NASA; awe; astronauts; overview effect; ultraview effect

1. Introduction

Due to a longstanding association between celestial bodies and the supernatural, there are clear, cross-cultural connections between religious concepts (particularly of lofty places associated with helpful or threatening deities) and the sky (including cosmic objects like planets and stars that are visible within it). As George Lakoff and Mark Johnson (Lakoff and Johnson 1981) state in *Metaphors We Live By*, the sky “metonymically stands for heaven, the natural habitat of the Holy Spirit” (Lakoff and Johnson 1981, p. 40). The English language, for instance, includes a collection of words and phrases that can refer to both space and to supernatural ideas about the imagined abode of God, angels, and select human souls—heavenly, celestial, etheric, otherworldly, etc. Postulated supernatural places and outer space seem to occupy a similar metaphoric category in that they are not of the Earth, stretch beyond and above the world, and surpass the mundane. These metaphors seem to anticipate

the strangeness humans actually feel in space, recognizing that as a species we evolved on, and within the specifications of, the particular planet we currently occupy.

In this paper, I examine a contemporary phenomenon that expands this apparent overlap between ideas of outer space and religious concepts, specifically experiences described by American astronauts during which their religious understandings were influenced or shaped by physically seeing sights (the Earth from space and vistas of stars from lunar orbit) that cannot be seen in the same way from Earth. In doing so, I demonstrate the utility of anthropological methods for learning what is really happening “on the ground” (so to speak) among astronauts and give examples of how religious practices might be influenced by the atypical sensations and visions available to astronauts. While Frank White’s (White 2014) concept of the overview effect is important and has been an influence on many of the astronauts I cite, I argue that seeing the Earth from space is not the only potentially religiously transformative scene an astronaut can witness, introducing the concept of the “ultraview effect”, a response to an unobserved view of stars that certain astronauts have described as life-changing. I analyze the way astronauts’ viewings of the Earth and stars may contribute to religious feelings by evoking a sense of wonder, drawing on ideas of awe and human transformation from psychology and philosophy, and suggest such experiences could have a role to play in shaping the way human societies of the future react to overwhelming situations and phenomena.

2. Background

Valerie Olson, an environmental anthropologist, has done fascinating work on outer space as an “extreme environment” (Olson 2018). Noting the alien essence of outer space (in comparison to what we know on Earth), Olson explained that the term “nature” is not typically a term applied to the cosmos, and that this un-naturalness is plainly dangerous for humans who seek to venture into this extreme environment. She mentions, for instance, that “Without gravity’s pull, blood and other fluids push upward and strain organ systems” (Olson 2018, Introduction, Location 96) and that radiation is a constant source of physical damage to humans in space. As an anthropologist of religion who sees human religious experience as fairly natural, adaptive, and typically falling within certain predictable constraints (see Boyer 2007), I’m interested in how and why individuals in space respond to their unearthly location. Anthropologists studying religion frequently borrow from other disciplines, with philosophy having a large theoretical influence in the anthropology of religion (see Bialecki 2016) and psychology (including evolutionary psychology) contributing much to religious understandings in cognitive anthropology (see, for example, d’Andrade 1995). Both disciplines, then, because of their focus on subjects’ inner lives, are useful in exploring astronauts’ religious experiences in outer space.

The strangeness humans tend to feel in space includes, from time to time, a sense of awe, particularly in situations where the enormity of the space around them (or of large bodies like the Earth or the Moon) becomes apparent. For the purposes of this paper I’m using the definition of awe provided by neuroscientist and science writer Summer Allen of the Greater Good Science Center at the University of California, Berkeley, in a white paper for the John Templeton Foundation (Allen 2018). Allen stated that awe is a “complex emotion that can be difficult to define. Feelings of awe can be positive or negative—Unlike most other emotions—And can arise from a wide range of stimuli” (Allen 2018, p. 2). She discussed theories that the feeling of awe evolved in humans because it may have “helped people identify safe places to seek shelter, such as environments with large vistas that would have allowed our hunter-gatherer relatives to see approaching predators or attackers” and suggested that it “may be adaptive because it encourages us to take in new information and adjust our mental structures around this information, helping us navigate our world and increasing our odds of survival” (Allen 2018, p. 2). Allen also argued that “awe’s ability to make us feel more connected with others and to be more helpful and generous may have also helped ensure our ancestors’ survival and reproductive success” (Allen 2018, p. 2). Allen cited Dacher Keltner and Jonathan Haidt’s analysis (Keltner and Haidt 2003) of the origins of the word “awe” in English, where they tied it to Old English and Old Norse terms for “fear and dread, particularly toward a divine being” and defined the current word in English as

“dread mingled with veneration, reverential or respectful fear; and the attitude of a mind subdued to profound reverence in the presence of supreme authority, moral greatness or sublimity¹, or mysterious sacredness”, although Allen noted that in contemporary English “awe” is often used to describe “a positive experience in nature” (Allen 2018, p. 7). When I refer to awe here (or use the similar term “wonder”), I mean the more complex sense of the term offered by Keltner and Haidt (2003).

Awe can be further explored through an analysis of the phenomena and situations that evoke the feeling. According to philosopher Timothy Morton, there exists a reality to certain huge objects or systems (he used the term “hyperobjects”) that is separate from humanity’s ability to perceive or judge them (Morton 2013). While human beings throughout the ages have had a slow but increasing awareness of large objects (like the globe or the ocean, for example), Morton specifically used hyperobject to refer to “massively distributed entities that can be thought or computered, but not directly touched or seen” (Morton 2013, p. 37), meaning our main awareness of them is achieved through the use of technology. These extreme phenomena (like “nuclear radiation” or “global warming”) exist apart from the human ability to truly comprehend them. For Morton, human “contact” with these objects is transformative in a very disruptive way: “... this is the moment at which massive nonhuman, nonsentient entities make decisive contact with humans, ending various human concepts such as ‘world,’ ‘horizon,’ ‘nature,’ and even ‘environment.’” (Morton 2013, p. 39). Through this contact, our understanding is fundamentally altered.

Hyperobjects are normally phased, meaning we only see parts of them at any given time, so they seem to come and go. In this view, the reality of a thing exists apart from our piecemeal impressions of the reality of things, and at this point in time we are starting, slowly, to comprehend them in their entirety. Morton wrote, “This is the historical moment at which hyperobjects become visible by humans. This visibility changes everything. We humans enter a new age of *sincerity*, which contains an intrinsic irony that is beyond the aestheticized, slightly plastic irony of the postmodern age” (Morton 2013, p. 42). He explained that like hidden images in Magic Eye puzzles, hyperobjects have always been there, we just didn’t know how to see them before due to their vastness, our incomplete understanding, and our previous lack of tools to help us perceive them (telescopes, Geiger counters, genetic analysis, etc.). Morton believes the human reaction to our newly sincere awareness of hyperobjects is “disgust” and “pain”, as our familiar illusions are replaced with a frightening perception of something truly alien. Are disgust and pain the only possible responses? Morton sees humanity as a whole coming to grips with a huge, only partially perceivable reality. We are limited, most of the time, by our size and our incomplete vantage point. Astronauts in space, however, get to see a bit more of “real” reality than is typical, and their reactions seem to offer more optimism than suggested by Morton.²

Psychologists Yannick Joye and Jan Verpooten (Joye and Verpooten 2013) argued that monumental architecture, like the Egyptian pyramids and other large religious constructions, are effective in evoking religious thoughts and behavior because they trigger an evolved “sensitivity for bigness” (Joye and Verpooten 2013, p. 56) in the human mind. They contend that large, awe-inspiring structures create a specific “emotional charging” (Joye and Verpooten 2013, p. 64) that renders visitors more open to religious beliefs and supernatural explanations. For Joye and Verpooten, awe can trigger feelings of “admiration, beauty, delight, goose bumps, aesthetic chills, fear, dizziness, romance or hope”, and that “exceptional vastness”, in particular, makes those that experience it feel “physically insignificant” in a way that “challenges or ‘shakes’ an individual’s cognitive conceptions, involving an inability to assimilate the awe-provoking experience into current mental structures” (Joye and Verpooten 2013, p. 57).

In a similar situation described by Piercarlo Valdesolo and Jesse Graham (Valdesolo and Graham 2013), psychological subjects made to experience awe responded first with uncertainty and then with an

¹ See (Burke 1898) and (Kant 2003) for classic essays on the concept of the sublime, and specifically (in Kant) on the mathematical sublime, experienced when humans encounter something whose size is overwhelming.

² For more on Timothy Morton’s hyperobject concept and outer space, see (Oman-Reagan 2016).

increased tendency to detect agency (where there was none) in an experiment. They explained, "(I)n the moment of awe, some of the fear and trembling can be mitigated by perceiving an author's hand in the experience" (Valdesolo and Graham 2013, p. 177), which made subjects more open to religious ideas and explanations. The aforementioned Keltner and Haidt (2003) broke down the experience of awe, describing it as a sense of vastness is followed by a resulting need for accommodation. They wrote, "awe can transform people and reorient their lives, goals, and values. Given the stability of personality and values... awe-inducing events may be one of the fastest and most powerful methods of personal change and growth" (Keltner and Haidt 2003, p. 312).

Awe is frequently present in religious contexts, and the creation of religious structures and situations that increase the likeliness that religious adherents will experience awe is quite common. These structures and situations are diverse, ranging from the large monuments discussed by Joye and Verpooten to the use of bullroarers to create a subsonic, unconscious sense of the numinous in the rituals of New Guinea's Iahita Arapesh people, described by anthropologist Donald Tuzin (Tuzin 1984). In the West, as anthropologist Birgit Meyer wrote, "... the craving for deep experiences that involve some kind of 'wow' ... has generated a veritable market for the production of wonder-working devices, body techniques and spectacular performances that are made to impress via strong sensations and feelings" (Meyer 2015, p. 22). All of the awe-inducing religions that have been studied by scholars (so far) have been constrained by their Earth-bound circumstances; indeed the human sense of the sacred and the numinous was formed on Earth. What happens to human religious understandings and expressions when they are removed from their "natural habitat" and relocated into what one of Olson's interlocutors called "the awfulness of real outer space" (Olson 2018, Conclusion, Location 3937)?

Although human presence in outer space has only been possible since the 1960s and our data about outer space-inspired awe and its impact on religion is quite limited, an analysis of what we do know may help us understand more about the relationship between awe and religious experience in general and the religious impact of the direct human experience of outer space more specifically. How does exposure to the enormous vistas of the Earth, Moon, and galaxy impact astronauts, and might there exist similar experiences for humans who never leave the planet?

In this paper I analyze two visual perspectives unavailable to earth-bound humans in terms of their subjective, sometimes religious, impact on astronauts and in terms of their potential cultural impact. While both have been reproduced in photographs, my respondents affirmed that photographs do not accurately convey the actual experience. The first is the view of Earth as seen from space, a vista that evokes the response journalist White (2014) has deemed the overview effect. White wrote that "The Overview Effect is a cognitive shift in awareness reported by some astronauts and cosmonauts during spaceflight, often while viewing the earth from orbit ... It refers to the experience of seeing firsthand the reality that the Earth is in space, a tiny, fragile ball of life, 'hanging in the void,' shielded and nourished by a paper-thin atmosphere" (White 2014, p. 2). Human responses to the overview effect include a stronger sense of connection to life on the planet, a feeling of protectiveness, and a greater appreciation for the planet's beauty.

Yaden et al. (2016), in a psychological analysis of White's concept, wrote that "a distant view of Earth ... suggests totality ... The wholeness of the Earth makes it a symbol of almost all that is meaningful in human life; it has tremendous, perhaps absolute, conceptual vastness. Seeing it from a distance, when one is disconnected physically yet connected emotionally, conjures thoughts of home, of the entirety of one's world, and of mankind [*sic*] as a whole." They also noted the resulting awe experienced by many astronauts is a "broaden and build" type of emotion, not just pleasant to experience, but capable of increasing and improving the experiencer in terms of both psychological and social resources. "Positive emotions", they argued further, "have been suggested to improve cardiovascular health, facilitate better collaboration in groups and even enhance creativity" (Yaden et al. 2016, p. 4).

The second perspective is the view of space seen from outside the Earth's atmosphere, either from Earth orbit or lunar orbit, which I call the ultraview effect. Although it is similar to another term Frank

White coined, the “universal insight,” he sees the latter as “an intensification of the Overview Effect that brings a similar understanding of the nature of the universe and our place in it” (White 2018, Appendix B, Location 3014). My term, on the other hand, while borrowing its structure from White’s original overview effect concept, is much less about an intensified feeling of connection to and protectiveness of our planet, and more about a very real sense of the limitations of what we know compared to the vastness of what we don’t know. I chose the morpheme “ultra” in this context because it is the Latin term for “beyond” but is often used to mean the “extreme”. If the overview effect is about an increased understanding and awareness of the earth after seeing it from the outside, and the universal insight is an increased understanding and awareness of “the universe and our place in it”, the ultraview effect is a transformative sense of incomprehension and a feeling of shrinking or self-diminution³ that comes from seeing vistas that one is, to quote an astronaut I interviewed, “not ready for”. While the overview effect has been studied a great deal and has become part of astronaut culture, the ultraview effect is all but unstudied, even though it seems to have had a tremendous impact on several astronauts who described it, and is a stronger example of a hyperobject, given the impossibility of seeing, experiencing, or understanding the totality of outer space.

Due to the fact that so many astronauts, both in publications and in interviews, have talked about changes to their religious beliefs or outlooks as a result of things they’ve experienced or seen in outer space, this paper will also consider the impact of the overview and ultraview effects on religious perspectives and understandings. According to anthropologist Clifford Geertz, religion is “a system of symbols which acts to establish powerful, pervasive, and long-lasting moods and motivations in men by formulating conceptions of a general order of existence and clothing those conceptions with such an aura of factuality that the moods and motivations seem uniquely realistic” (Geertz 1973, p. 90). I am using Geertz’s definition in this paper, particularly its focus on how religion helps create a sense of a “general order of existence” with “an aura of factuality” that is “uniquely realistic”. Geertz has argued that while humans share “a simple acceptance of the world, its objects, and its processes as being just what they seem to be” the “scientific perspective” encourages “Deliberate doubt and systematic inquiry” (Geertz 1973, p. 111). Similarly, religious texts, stories, etc. move “beyond the realities of everyday life to wider ones which correct and complete them” and it is “this sense of the ‘really real’ upon which the religious perspective rests” (Geertz 1973, p. 112). Briefly, both science and religion argue that there is far more to reality that meets the eye and experiences of awe, wonder, and contact with forces beyond the human capacity for understanding, such as those experienced by many astronauts, sometimes catalyze a change in what a person subjectively understands as “real”, whether that change is to a more religious perception, a more scientific perception, or some novel fusion.

3. Methodology

I started my academic career as an anthropologist of pilgrimage and tourism, studying both the religious and secular uses of Catholic shrines. I have had a lifelong interest in space exploration and after marrying a former NASA employee, this interest, along with my knowledge of the subculture, grew. I conducted my first interview with an astronaut in 2004, but most of the scholarship undertaken for this article (following Research Ethics and Compliance training and approved by my university’s

³ This sense of smallness was anticipated before any human actually went into space by many, and finds expression on a (Walter 1955) record album entitled *Exploring the Unknown*. The album depicts a fictional tour of the solar system and beyond, concluding with a song called “Look Up,” with the lyrics:

Look up, look up, look up/Beyond the fading Sun./There’s light enough that’s bright enough/To keep the faith in everyone/Look up, look up, look up/And find a falling star/The hand divine that made it shine reminds us just how small we are/Orderly, they turn in space and someone was commanding all/Orderly, they burn in space and someone, somewhere planned it all/Look up, look up, look up/And watch the heavens glow/The more we see infinity/The more our faith will grow/Look up, look up, look up!!!!

Institutional Review Board) was carried out between 2017 and 2020. I have interviewed 37 “space workers” over the last three years, including physicists (several at the Vatican Observatory), engineers, test pilots, computer programmers, and physicians involved in space medicine. I have done fourteen interviews with nine astronauts so far.

Unsurprisingly given their renown, astronauts are typically the most difficult participants to make contact with, but using “snowball sampling”, where one interviewee recommends another, I have been able to make several connections. Chaim Noy provided an excellent analysis of snowball sampling, a research “tactic” used in ethnographic work where “the researcher accesses informants through contact information that is provided by other informants. This process is, by necessity, repetitive: informants refer the researcher to other informants who are contacted by the researcher and then refer her or him to yet other informants, and so on” (Noy 2008, p. 330). In my case, since I’ve interviewed multiple types of space workers, I have made contacts with astronauts through a space historian, an astronomer, and, of course, through other astronauts. Noy pointed out that snowball sampling, “arguably the most widely employed method of sampling in qualitative research” (Noy 2008, p. 330), is particularly useful when trying to interview groups that are somewhat protective of their identities. He explained that while it is often used to initiate research with members of marginalized groups, it can also be helpful to access people who “enjoy the status of social elites” (Noy 2008, p. 331), see also (Moyser and Wagstaffe 1987). Astronauts and others whose work in or about space puts them in the public eye are often justifiably wary when approached, so being connected through a mutual acquaintance helps establish the trust and rapport that ethnographic research requires.

This research also falls under what George Marcus has called multisited ethnography (Marcus 1995). Astronauts and other space workers don’t live in a single community, but are spread wide and far among different communities. Therefore, as an anthropologist I have immersed myself in “space culture”, not in a single “village”, but by entering the workspaces of many of my interlocutors, attending (and presenting at) engineering and space medicine conferences, visiting NASA flight centers, and even going to space-focused conventions. I have conducted interviews in hotel lobbies, academic offices, restaurants, a pilot’s lounge, and a convention center meeting room, among other places, as well as via telephone calls and video chat programs like Zoom. While some astronauts were eager to talk about their religious beliefs, others only spoke to me after I explained the conventional use of pseudonyms in most ethnographic work, wanting to keep their religious ideas (or lack of them) private. In general, retired astronauts are far more likely to consent to an interview than active astronauts, probably because opening up about a controversial topic like religion, even when one’s identity is hidden, seems at least potentially risky. I have also relied on the public talks and published memoirs of astronauts, following the precedent of space ethnographers like Debbora Battaglia (Battaglia 2012).

Data collection from just my own primary sources resulted in hundreds of pages of interview transcripts and field notes. I took these, along with my notes from secondary sources, and undertook a process of careful coding and content analysis, during which I identified units of meaning, determined code terms, categorized information, and distinguished and connected different themes. My principal interest in this part of my research was the subjective experiences of astronauts in space, looking for both common patterns and for singular perceptions based on unique circumstances, which I was then able to compare with existing reports from anthropology, psychology, and other disciplines.

4. Ethnographic Data

As mentioned above, following anthropological convention, I used pseudonyms for my participants and also may have occasionally changed small identifying details to help preserve the anonymity of my interlocutors. I started with astronauts for whom the overview effect, if it existed at all, was mild, then moved through others whose experiences were more dramatic, and sometimes even interpreted religiously. I then turned to reports that support the idea of an ultraview effect, discussing how and why it appears distinct from the overview effect.

Paul, in his 70s at the time of our interview, made multiple space shuttle flights and was one of the lucky few who never experienced motion sickness in space and deeply enjoyed the opportunity to walk across ceilings, sit on walls and do other perception-altering things afforded by microgravity. He told me:

Everybody who flies in space comes back a little different ... [but] I didn't develop any sort of spiritual awakening or that kind of thing by being in space. When you look out the window, you look at the Earth, and you recognize that we are seven and a half billion people who all share this one planet together, and the question that always crossed my mind was why can't we get along? So, I think that occurred to me. And then I developed more of an ecological bent more than anything else ... And you recognize how fragile this planet is and how important it is for us to take care of it.

Alan, a retired astronaut in his early 50s who flew more recently than Paul, made a few trips to the International Space Station. His first time there he was excited about the possibility of experiencing the overview effect, having been told about it by other astronauts. Alan said:

I remember before I flew in space, [two colleagues] spoke very eloquently about it in some of their transmissions from [their shuttle] and so I was aware of it and I was prepared to have a very transformative moment. The first time I looked out at the Earth from space ... I even intentionally paused and kind of collected myself and meditated a little bit to kind of clear my head before I opened my eyes and looked out the window for the first time. And I didn't really feel anything. It's kind of a letdown. There was nothing. And maybe it's because I'm not a spiritual person, that's quite possible ... It was a beautiful sight and a unique vantage point, but there was nothing about it that I felt in any way unlocked any kind of philosophical mysteries or spiritual mysteries.

Like Paul, seeing the Earth from space, particularly the thin blue line of the atmosphere (which he described as a "very vivid, graphical depiction of the fragility of our planet" that "just gave me a better appreciation"), made Alan more sensitive to issues like climate change, but he felt little in terms of awe and no great revelations about humanity. He explained, somewhat flippantly:

As far as the Overview Effect and getting a sense that we are a common humanity, and we all share a common home, and at the end of the day that the things that unite human beings are commonalities between human beings that are greater than the things that divide us ... You know, I think the reason that I didn't come away with some kind of sudden, strong compelling feeling in that regard is that I think I knew that before I left.

Beverly, who became an astronaut after working for NASA in other capacities, was quite religious in her personal life but didn't find the view of the Earth from the shuttle particularly perspective changing. She attributed this, as Alan did, to having learned the lessons the overview effect was meant to teach before ever going into space. Beverly said:

On a personal level ... and this is, I think wrapped into the whole idea of the overview effect, when I came back, the things that really resonated with me [were] at the simple base level of it. We live on a planet, we're all earthlings, the only border that matters is this line of atmosphere that blankets us all. And I knew those things before I flew to space. I didn't think of them very much.

Still, knowing those things and seeing them firsthand were different. She continued:

It's this experience that puts that reality in your face in a way that you can't deny. You're like, "Oh my gosh, that is a planet. Look at that, everybody I know is down there, it's really beautiful." All those things. "Look at that little super thin, wafer thin line that's all around it. Wow, it's holding all the good stuff in." That kind of thing. You don't have to go to space for

this . . . I want my children to understand that. They might not ever get to go to space, but I don't want them to have to think, "Oh I have to go to space to be able to appreciate that."

Alan and Beverly were both in their fifties at the time of their interviews and grew up in a time when images of the Earth taken from space, like the famous "Earthrise" photograph taken by Apollo 8 Lunar Module Pilot William A. Anders (who himself reported becoming less religious in response to seeing the Earth from space⁴), were commonplace. As Frank White suggests, even a photograph of the entire Earth may be enough to change people's perceptions of the planet by showing the entirety of the planet as a bounded, singular object, whether or not they traveled in space⁵.

On the other hand, the overview effect for Tom, a veteran in his 80s who began working for NASA during the Apollo era, did seem to change his sense of the world. In his public talks he has frequently mentioned realizing that national borders were artificial or seeing that we were just one planet. In our interview, however, he focused on the religious insight he gained from going into space and how it reinforced his existing spiritual understandings. He explained:

The space experience in my view, if one doesn't believe in God, I don't see how they can't be drawn just a little closer to having had it . . . When you're up there, I never felt an ethereal experience . . . but the experience is something that you can't really prepare for in terms of how it's going to affect your life later. And I think it has. It didn't do so immediately . . . You don't realize how much it affects your life until later on, but everything you do after that has something of that perspective in it. Even subconsciously. And to me, I notice that I'm not patient at all with trivia . . . Because I've seen the bigger picture.

Paul, Alan, Beverly, and Tom, though their experiences were quite different, felt they understood more about earth, humanity, and the "bigger picture" after seeing earth from space.

Don, another Apollo-era octogenarian, described seeing the Earth from space somewhat differently. When he discussed being an astronaut, he typically compared it unfavorably to the satisfaction and fulfillment of being a Christian, an approach that was carried over in the way he talked about seeing the Earth from space. For example, Don characterized the experience as a way to verify the veracity of the Bible. He explained to me:

I believe God has given us the signs in the heaven that most people don't recognize . . . There are scriptures like 'God sits enthroned above the circle of the earth'. Well, with my eyes, I've seen the circle of the earth . . . and when that was written way, way, 800 years before Jesus, nobody had seen the circle of the earth, but God had . . . And in the book of Job, there's a verse that says, when God made the earth, he suspended it upon nothing. And that's exactly what it looks like . . . the Bible is not a textbook or science book, but when it touches on science, it's accurate I've seen.

Looking at the Earth from space was worthwhile for Don, though, even beyond giving him a chance to witness biblical descriptions first-hand. When I mentioned a paper by Damjanov and Crouch (Damjanov and Crouch 2019) that suggested that the view during suborbital tourism might be less than optimal and that virtual reality could "extend or complete the experience" (Damjanov and Crouch 2019, p. 134), he disagreed, responding:

⁴ Bill Anders has discussed his own reaction to seeing the Earth from space in interviews, and the experience apparently jolted him into a very different religious mindset, one more closely associated with atheism. Perhaps the sense of the "really real" he had learned in church was contradicted by what he saw. In an interview with *The Guardian*, he explained, "It really undercut my religious beliefs. The idea that things rotate around the pope and up there is a big supercomputer wondering whether Billy was a good boy yesterday? It doesn't make any sense. I became a big buddy of [the scientist] Richard Dawkins" (Sample 2018).

⁵ The negative outcomes of "whole Earth" photographs were explored in a fascinating essay by (Garb 1985). Garb argued that the "icon" of the Earth from space may make humans disassociate themselves from the planet and feel unrealistically independent from it, homogenize the Earth's distinct cultures and climates, and unconsciously reduce the Earth from a living thing to a mechanical machine. White, of course, sees the image in a much more positive, less critical light.

I told my friend on his [planned] Virgin Galactic flight, don't unstrap, just look out the window . . . You can do zero gravity on an airplane—five thousand bucks and you can do zero gravity. But you'll never have a view like you're going to have by looking out the window to see the curvature of the Earth and the beauty of the Earth from 400,000 feet, it's five minutes. It will change your life. Look out the window.

The idea of the overview effect appears to have penetrated the culture of astronauts, and those new to space travel, like Alan, have learned to expect a dramatic subjective response of some kind. Reactions, though, seem to be as variable as the people who experience them. Theo, a veteran of many missions, entertained himself by watching first-time astronauts respond to the view of the Earth from orbit, but, as a very spiritual person himself, knew internal experiences were not always readable by observers. He told me:

I've flown with [many] rookies and I've seen them, bang! First time that it hit them. And I'm a people watcher. So my general conclusion is I have a hard time seeing any changes in them. But If you look at [me] you probably don't see the changes either . . . it doesn't mean they did not have a spiritual experience.

Theo liked to include distant pictures of Earth taken from robotic probes in his public presentations, hoping these views could enact some kind of change in those who saw them. These distant views of the Earth, he explained, provide:

. . . a perspective that if it were to guide human beings, we would be different. . . (T)hose views can guide us as human beings. If you look upon it [as though] we all are sharing this little spaceship, it would guide our behavior differently. We wouldn't be at war all the time. We would have respect for other humans on that journey together.

My unavoidably small sample size of astronauts, as limited as it was, included both people for whom looking at the Earth from space inspired them spiritually and those for whom it did not. Firm conclusions cannot be reached from this ethnographic data, but the first-hand experiences of these astronauts suggest that human response to seeing the Earth from space is variable, that astronauts are socialized through interactions with more experienced colleagues to expect some sort of response, and that the experience of seeing our planet as an external, separate "thing" can shift the way people understand the reality of being a human on Earth, particularly if the view they see of a borderless, fragile orb is at odds with what they have previously understood. A heightened understanding of the hyperobject that is our planet, from a heretofore unseen perspective, clearly has the potential, at least, to enact interior change.

Every astronaut I've interviewed has had an opinion of and some kind of experience of the overview effect. The second visual experience I want to examine, what I call the ultraview effect, is comparatively rare and hard to come by. From what those who have experienced it report, it seems to require two things: first, circumstances where the viewer is primed to experience awe, and second, the ability to see the space around oneself under very specific, hard-to-arrange conditions. As we turn to the ultraview effect, I want to focus on the experiences of an eighth astronaut, seventy-something Charles, a fundamentalist-turned-Lutheran shuttle veteran with a profound interest in theology and an agnostic commitment to honestly representing what he does not know. Charles' experience of the overview effect was relatively modest, although enjoyable. He told me about one memorable incident:

Part of the earth had turned away from the sun (which is where the auroras are) and the Aurora Australis was active and, oh yeah, you can see waves in it. And also, this was the period of the Perseids shower. So, while I'm watching this, I'm seeing shooting stars below me in the atmosphere. And it was pretty awesome. And . . . there was a sense, I was just surprisingly comfortable there. And so, as I thought back over it that's when I started thinking that, really, that humans might have a future in space.

Charles' God's-eye view of the Earth's atmospheric phenomena didn't overturn or intensify his religious beliefs, but the ease with which he experienced it did make him more certain that the human exploration of space was worthwhile.

Though Charles was one of hundreds of humans to see the planet from orbit, he was only one of a far smaller group to see stars as they do not, and cannot, look from the Earth. Due to the special circumstances of his mission, Charles was able to look out into space and really see it in an unusual way. He climbed into a camera bay, shut the Velcro curtains around his waist and let himself become dark-adapted. Although the experience was striking, it didn't create the same sense of wonder he experienced looking at Earth. He explained, "You are very aware of the sky being full of stars and you're also very aware of the colors of them . . . I was much more aware of the color and much more aware of the numbers and the patterns. It was just beautiful." Charles' description of his view of the Earth, however, was more vivid and he was clearly more emotionally engaged while looking down at the planet than when looking at the stars, however beautiful they were.

Charles had a rare situation where he was able to get fully dark-adapted before seeing the stars, but the typical workload on, and view from, an orbiting shuttle or from the International Space Station does not generally permit this, making it even less likely that an astronaut will see an incredible stellar view. As Alan (who never got dark-adapted, to his regret) explained, looking at the stars from orbit:

... is hard, you have to work at it to look the other way, at least from the Space Station, because almost all the windows pointed at the Earth . . . it doesn't look that much better than it does from down here. There's no atmospheric distortion, so the stars are a little bit brighter and . . . they don't flicker—the twinkling of course, you don't get that. But otherwise, if you'd go out to Joshua Tree⁶ on a really good clear night it kind of looks like that.

Getting further away from the Earth seems to help with the conditions, although even then the direction of sunlight and the absence or presence of shadows makes a difference. Some of the Apollo astronauts wrote about what they could or could not see of the stars in the open spaces around them. John Young (Young and Hansen 2012), Command Module Pilot of Apollo 10 (which orbited the Moon and practiced maneuvers ahead of Apollo 11's first lunar landing), wrote in his memoir, "Because of the light reflected back off Earth into my telescope optics—and it didn't take much—seeing any stars while you were still flying in the vicinity of Earth was very difficult" (Young and Hansen 2012, p. 128). James Irwin and William A. Emerson (Irwin and Emerson 1982), Lunar Module Pilot for Apollo 15, who frequently credited his experience on the Moon with reinstating his Christian beliefs, did not see much of a stellar view. He explained that during a spacewalk with Command Module Pilot Alfred Worden, " . . . there was so much of the sun's reflected light on the vehicle that I couldn't see the stars" (Irwin and Emerson 1982, p. 100). As for the view of stars from the Moon itself, Charles Duke, Lunar Module Commander for Apollo 16, said, "Stars don't look any different from the moon than they do from earth" (Duke and Duke 2011, Sweet Sixteen Has Arrived!, Location 2517).

While it is very common to have unimpressive views of stars while journeying in space, several astronauts who were able to get away from nearly all earthly or artificial sources of light have written about seeing views of the cosmos around them that were overwhelming. While in orbit around the Earth, Michael Collins (Collins 1974) left his Gemini 10 craft to do an extra-vehicular activity in near-total darkness ("the moon is not up and the only identifiable light comes from an occasional lightning flash") and described his experience as deeply overwhelming, writing:

My first impression is a feeling of awe at the wide visual field, a sense of release after the narrow restrictions of the tiny Gemini window. My God, the stars are everywhere: above me on all sides, even below me somewhat, down there next to that obscure horizon. The stars are bright and they are steady. Of course, I know that a star's twinkle is created

⁶ Joshua Tree is a national park in the California desert designated as a "Dark Sky Park".

by the atmosphere, and I have seen twinkle-less stars before in a planetarium, but this is different; this is no simulation, this is the best view of the universe that a human has ever had. (Collins 1974, pp. 220–21)

Edgar Mitchell, Lunar Module Pilot for Apollo 14, was known for his exploration of the limits of human consciousness, conducting experiments in extrasensory perception during his Apollo mission and later founding the Institute of Noetic Sciences to help study the type of instantaneous knowledge he claimed to have received about the unity of the universe and humankind while in space. Perhaps unsurprisingly, then, he described experiences viewing outer space that brought about awe and a subjective shift in perception. His full experience is often conflated with the overview effect, which was certainly an element of what he described, but parts of it seem much closer to the ultraview effect. Mitchell said about space, “There is a sense of unreality here, with the absence of gravity and the tapestry of blackness broken only by an overwhelming glitter of stars that surrounded our craft”, (Mitchell and Williams 2008, p. 61) and explained further:

In space there are nearly 10 times more stars visible to the naked eye than on earth because there is no atmosphere. Likewise, familiar objects are approximately 10 times brighter. Stars and planets seem to burn against the cool blackness. There is the sense of being swaddled in the cosmos, surrounded by the beautiful silent glitter of the Milky Way and all the galaxies beyond”. (Mitchell and Williams 2008, p. 73)

Tied to this sensation was a strange awareness: “Somehow I felt tuned into something much larger than myself, something much larger than the planet in the window. Something incomprehensibly big. Even today the perceptions still baffle me” (Mitchell and Williams 2008, p. 74). Like the overview effect, the ultraview effect has the potential to evoke formidable, overpowering emotions and alter human perception, although it may be more likely than the overview effect to do so. Collins appears to have experienced a taste of it (although he did not describe a transformative effect), while Mitchell described his consciousness of himself and reality as having been truly changed. Mitchell’s description also recalls Morton’s “massively distributed entities” that can be sensed but not truly understood (Mitchell and Williams 2008, p. 37).

The only astronaut I have interviewed so far who had a deep emotional reaction to and internal transformation from the view of stars he had from the deep darkness of space was an Apollo crewmember in his 80s, whom I call Zack, who spent several days in orbit around the Moon while the rest of his crew explored the lunar surface below. Although he was busy with NASA assignments, he did take time to take in the view outside his window. He stated in one of our interviews:

Looking at the universe out there from my vantage point, I began to realize that we don’t know crap about anything, we really don’t . . . (A)t some points in my orbit around the moon, I was sheltered from both the earth and the sun, so I was in complete darkness. And all of a sudden, the star patterns out there became something that I was not ready for . . . So many stars I couldn’t see one. Just a sheet of light. I don’t know whether you’d call it spiritual or not, but when I saw the starfield out there in a way that nobody else has ever seen . . . I had some pretty profound thoughts... We are not unique in the universe. When I came back from my flight, we were all totally exhausted . . . I’d sit in my living room and all these thoughts would come flowing through, so I began writing them down . . . They flowed from my mind through a pen onto a piece of paper. It was like I was being guided by something . . .

Zack wrote poetry as a way of processing his time in space. One of his poems describes seeing light from various perspectives, including the “starfield” he mentioned to me, and how he was blinded and left unable to think because of the enormity of its light. For Zack, the experiences of total solitude in orbit, an incomprehensible sheet of light, microgravity, and exhaustion all combined to influence his reckoning with something he didn’t understand. The sheer number of stars he saw convinced him that other intelligent beings must exist throughout the universe. He gradually began to modify

certain beliefs from his conventional mid-line Protestant upbringing, reading theories about life being brought to Earth by alien races and became convinced, for instance, that the long lives of biblical figures like Noah proved they were descended from extraterrestrials who created humanity and that the “wheel” mentioned in the Book of Ezekiel was a description of an alien spaceship. Zack was a rational person, a successful author and businessman, but his unconventional religious beliefs were absolutely influenced by his time in space, which he said changed his idea of infinity and his whole outlook. He concluded, “We are not unique in the universe. I happen to believe we came from somewhere else.”

5. Analysis and Conclusions

Published accounts by other astronauts frequently include descriptions of strong responses to being in space, whether the renewed Christianity of the aforementioned James Irwin (Irwin and Emerson 1982) of Apollo 15, who went on to search for Noah’s ark on Mt. Ararat, or the metamorphosis experienced by Apollo 14’s Mitchell and Williams (Mitchell and Williams 2008), whose “palpable” experience of divinity and connection in space, described above, led to a life-long exploration of the noetic transmission of knowledge. Why do some of these experiences, particularly those of the Apollo astronauts who journeyed much farther into space than those who have followed them, seem to work as catalysts to change astronauts’ religious or spiritual perspectives?

It is certainly possible that participating in unusual, historic occurrences, whether journeying to the Moon in the 1960s, winning the lottery, or surviving a terrible disaster, can make an individual question why an event happened and wonder whether a supernatural being or power is somehow involved. The astronaut I call Tom, for instance, thought his whole life was guided by divine forces. He said, “I believe God can direct a person’s life; I think God has a plan for every person’s life. And if there’s a relationship with him where there’s a two-way conversation and there’s a real attempt to have a personal God that he can direct a person’s life.” Tom’s life was unusual in that he had a large share of adventure, success, and fame, and he was able to explain this through religious means. He frequently explained that God gave him the experience of being an astronaut, in part, to make him a more effective evangelist. Fame provides an audience. At the same time, however, when he was orbiting the Earth and seeing the planet as the creation of a “master engineer”, something else was going on.

Many people live and die on Earth without ever having conscious awareness that we are on a literal sphere that rotates in space, orbiting a star. The sun, for them, is a brightly glowing light in the sky during the day and the Moon is a softly glowing light at night, with the reality of the solar system, galaxy, and universe something beyond real comprehension or interest. For some others there is an awareness of and curiosity about the bodies that can be viewed through telescopes and via images returned by probes or described in great detail by scientists, with real knowledge largely supplemented by imagination. Actually going into space, though, leaving the protective atmosphere of the planet and looking back at this round rock we all inhabit is very uncommon and deeply strange. The reality of the experience cannot be ignored or denied by those undertaking it. Astronauts may grow used to the sight of the terrain below them, but there is a shared cultural understanding in their ranks that seeing the roundness of the planet, the thin blue atmosphere, and the colors and weather patterns that shift with time is a rare gift. When the Apollo astronauts saw the Moon close up and even walked on it, they experienced an interaction with the real face of a largely imagined object that no one else had ever had before or has had since. Astronauts are often treated as super-human (see Weibel 2019), and while part of that is likely due to how competitive the astronaut selection process is, some of what impresses the general public is that astronauts have seen a level of reality, of truth, beyond what the vast majority of us will ever experience.

Astronauts have first-hand encounters with the Earth, the Moon, and, to some extent, the stars, which increase and improve our species’ understandings of these objects, adding field data to what we can glean from telescopes, probes, and mathematics. The Apollo missions meant that the Moon was transformed from a mysterious cratered hyperobject to an actual “place” where people walked, golfed, and drove (see Messeri 2016). Our technology has allowed a massive increase in our knowledge,

both mediated via robotic probes and first-hand, of massive celestial bodies. Humanity's awareness of hyperobjects, true confrontations with the extreme, is increasing daily, and examples from astronaut experiences suggest these confrontations can be qualitatively improved, made more pleasant and more conducive to astronauts' psychological wellbeing, through some kind of cultural mediation. Astronauts learn from other astronauts that they may see something special "up there" and, at least some of the time, respond in ways that make them humbler, more thoughtful, and, occasionally, more open to religious and spiritual beliefs⁷. The awesome sights astronauts can view from space might easily have inspired fear or disgust. For instance, Zack described the "hostility" of the "very unfriendly . . . very unforgiving" Moon and how from even inside a spacecraft where he knew he was safe, he could sense the danger of the place: "You are so cut off from everything you know and here all of a sudden you're looking at the Moon that you probably looked at thousands of times growing up, and here you are anywhere from 60 to 10 miles away from it, and it's . . . different." If more experienced astronauts continually described the Moon as "hostile" and "unfriendly" to less experienced astronauts, this would likely condition the new astronauts to interpret the Moon in a negative way, much as stories passed astronaut-to-astronaut about seeing the Earth from space seem to have conditioned astronauts to expect the overview effect. They anticipate awe, some, but not all, experience it, and among those who do are those who respond to the "cognitive shaking" that results by discarding long-held beliefs (religious or otherwise) and embracing a (literal) new worldview.

Experiencing the true nature of huge, seemingly incomprehensible objects creates awe, fear, and wonder, which can be stressful. The work (discussed earlier) by psychologists [Joye and Verpooten \(2013\)](#), [Valdesolo and Graham \(2013\)](#), and [Keltner and Haidt \(2003\)](#) suggests that situations that cause awe are fundamentally disturbing, but that responses that detect superhuman agency or result in personal transformation often provide relief. Tom's interpretation of the Earth as a product of God's engineering, Zack's conviction that there was intelligent life on other planets that led to life on Earth, and even milder reactions, like the increased ecological concerns of Alan, Paul, and Beverly are all examples. As we become increasingly cognizant of more of the hyperobjects Morton describes (including, at the time of this writing, COVID-19 spreading across the world in a pandemic), there is an opportunity to shape our need for accommodation in socially constructive ways. An experience of awe or of being overpowered can be channeled into positive outcomes, even social transformation, and humanity may benefit, rather than suffer, from being made to confront the extreme in outer space and elsewhere. For instance, Yaden et al. associated feelings of awe with increased creativity and ability to collaborate ([Yaden et al. 2016](#), p. 4). When a person or community's sense of what is "really real" is transformed, particularly if this new "reality" is seen in a welcome light, there may be additional benefits, including increased morale and motivation ([Yaden et al. 2016](#), p. 8). Studying the subjective responses of those who confront hyperobjects, particularly using ethnographic techniques that highlight the cultural context and shared, mediated experience of these reactions, can shed light on what may improve the experience of these unsettling encounters.

Frank White argued that the shared context of astronauts is what enables them to expect and easily process the overview effect. Astronaut Ed Gibson reinforced this with his comment, "The more you go, the more difference it will make" ([White 2014](#), p. 7). Zack's sense of the "hostility" of the Moon was likely conditioned, to some degree, from reports from earlier Apollo astronauts like Edwin "Buzz" Aldrin, who famously characterized the satellite as a place of "magnificent desolation." A lack

⁷ While the ultraview effect is based on what an astronaut sees, not all transformative experiences in space are visual. The aforementioned Theo, who liked to watch other astronauts see the Earth from space for the first time, conducted a sort of sensory deprivation-style meditation in space on multiple occasions. He would put himself into a what he called a "perfect drop," a recreation of the womb experience of the human embryo, where he would float in the spacecraft in the dark, touching nothing, hitting no walls, and losing all sense of having a body. He said, " . . . it's totally being lost. It's totally Buddhist. And then you lose track of your limbs because... you have flexors and extensors [telling you] . . . gravity's pulling my arm down here and it's stretching one or the other, but here in the embryonic, every single joint is in a neutral state . . . Nothing pushing 'em . . . So you lose track of your limbs. There's nothing to tell you you have limbs."

of shared experience with other astronauts, however, likely made Zack's ultraview encounter with the "starfield" more dramatic, and even traumatic, than it would have been otherwise. He didn't interpret it in terms of Mitchell's "noetic" experience and largely processed it on his own. In contrast, the experience of the overview effect, which, when carefully anticipated and normalized in astronaut culture, typically provides astronauts with reassuring context. If humans can learn to culturally prepare for hyperobjects like those encountered in space, including planning for the "fear and trembling" that follows, there may be benefits. Jackie, an active NASA astronaut I interviewed before she was assigned to her first mission, told me:

Obviously, I haven't been to space so I haven't seen it, but a lot of times people mention the most amazing kind of emotion that they have when they launch into space as the first time they get to turn and look back at our planet and to see, you know, this beautiful blue marble and complete black blackness that people say you can't even describe until you see it.

NASA astronauts are clearly preparing each other to experience awe, which might mitigate any shock by defining the experience of seeing the Earth from space as a good one, but also may act, in some cases, as a self-fulfilling prophecy. Despite the somewhat disappointing experiences of Alan and Paul (and probably a few others) if an astronaut expects that seeing the Earth from space will be a positive, moving experience, the expectation makes the positive response more likely.

Morton argued that the human response to most hyperobjects is fear, disgust, and pain—the shock-filled emotions experienced by those realizing their limited capacity to respond to or control something literally incomprehensible. We seem to be better prepared for the unfathomability of outer space than we are for global warming, nuclear radiation, and pandemic illness. While some of our dismay with certain hyperobjects may come from the sense that we are somehow responsible for creating them but at a loss to how to manage them (climate change, mass extinctions, and the hole in the ozone layer come to mind), those that may not be directly influenced by human actions may be easier to see as having a divine origin or as being under divine control—religions around the world have tied their ideas about the sky to notions of gods, goddesses, ancestors, and the supernatural. Danger may come from the sky in the form of meteors, solar flares, etc., but we also look to the sky for help. If Valdesolo and Graham are correct, and the "fear and trembling" can subside and be replaced with what Yaden et al. describe as the psychologically beneficial experience of awe, inspiring determination and optimism if we somehow can imagine a greater plan at work (as did both Ed Mitchell and "Zack", whose perceived "greater plans" countered mainstream religion) this might prepare us to face other largely incomprehensible phenomena head-on. More scholarship needs to be done on this, particularly ethnographic work, which can help us understand these processes not just among astronauts (and cosmonauts, and other publicly and privately funded spacefarers in multiple societies), but also among scientists, physicians, and others who study the edges of hyperobjects, trying to bring human understandings in line with realities that seem, at least at first, to be unknowable.

The number of astronauts I have interviewed is small, and while ethnographic interviews provide rich data, they do not establish larger trends. I would encourage additional research in this area, both large-scale quantitative work like surveys to get a sense of the scale and scope of astronaut experiences (as well as similar experiences among cosmonauts and other spacefarers working with other national and private organizations), and ethnographic work, which has been extremely limited in this population, but has the potential to reveal individual thoughts and experiences that would otherwise be left undiscovered. These two approaches should guide each other, with phenomena brought to light by one method further analyzed by the other. Personal experience is irreplaceable, as suggested by a well-known characterization of the overview effect made by aforementioned astronaut Ed Mitchell "You develop an instant global consciousness, a people orientation, an intense dissatisfaction with the state of the world, and a compulsion to do something about it. From out there on the moon, international politics look so petty. You want to grab a politician by the scruff of the neck and drag him a quarter of a million miles out and say, 'Look at that, you son of a bitch'" (People Weekly 1974, p. 23). If Mitchell was right, our willingness to confront hyperobjects and to recognize what little we know

and how much we still have left to learn may encourage better collaboration, heightened creativity, and set us upon a more hopeful path.

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Article

Models of Disability as Models of First Contact

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Abstract: Because humanity is a young technological species, any extraterrestrials we meet will inevitably be more advanced than we are. The realization that we are no longer dominant in our sphere of influence will inevitably cause spiritual cultural and even economic trauma as we come to terms with the new reality. The question we should endeavor to answer before this happens is: what direction will this trauma take and how can we prepare in advance to minimize harm as we adjust to this? Disability studies offer several models of how one advantaged group understands and interacts with a less advantaged group. These include the medical, social, moral/religious, economic, charity, and limits models, and each lays out a unique way of understanding situations where one group has a strong perceived or real advantage over another. Exploring these models can give us a sense of the possible variation that might occur upon first contact. Such an exploration is relevant both to how ET might perceive us and how we might begin to conceptualize ourselves in that new situation. As with most seemingly theoretical forays into astrobiology, this work has implications for the present as it interrogates how disabled and abled humans interact and negotiate power and how we understand one another.

Keywords: religion; outer space; cognition; space exploration; culture; history; science

1. Introduction

The scene has been retold countless times. In the summer of 1950, Physics Nobel Laureate Enrico Fermi was having lunch with colleagues. Without warning, he interrupts the conversation and asks: “Where is everybody?” This, no doubt, created some confusion until it was sorted out that he was referring back to a discussion he and colleagues had had earlier that morning about a series of UFO sightings in the news. His argument, and his question, went something like this: if, as has since been made clear, there are countless habitable planets circling countless other stars, and if these planets have had great expanses of time during which they could have brought forth life and later perhaps intelligence, why was the Milky Way not awash in advanced alien civilizations? And why, given that possibility, had we not been contacted?

This question has since become known as the Fermi paradox (Shostak 2018), it has sparked a great deal of scientific and philosophical debate, and its implications have been examined from every imaginable perspective. Bold and marvelous as humankind believes itself to be, the first contact with a truly advanced alien civilization will produce a reaction on a global scale as everyone alive is called to readjust their notion of themselves, humanity, and what the cosmos is like.

It is at least conceivable that, if we do make contact with an intelligent extraterrestrial species, their civilization would also be just finding their way into their own electronic age, but the odds are better that they will be significantly older and more experienced, well into whatever phase of development comes after ours (Davies 1995). They will most likely be far beyond us in every way we can conceive. Still, it may be possible to imagine what advanced technology might be like (Arthur 2011), but it is much more difficult to deduce how cultural or spiritual progress would manifest (Harari 2015). That is,

we might be able to guess what sorts of things they will have, but we will have a much harder time imagining what kind of people they will be.

More to the point, we will be forced to consider what such people will think of us, and what will happen to us once this connection is made. There have been attempts to think through the impact that contact will have on Earth civilization (Davis 2017; Dick 2018) and on religions in particular (Ambrosino 2016; Weintraub 2014). One of the often-used models used to frame these speculations is that of aboriginal people encountering western explorers. On Earth, these first contact scenarios have historically gone very, very badly for the less-technologically-savvy participant, resulting in everything from profound cultural disruption to genocide (Harari 2015). If what goes around comes around, humanity will be profoundly demoralized, perverted, or inevitably assimilated in the resulting culture (Sturm und Drang), assuming we survive at all.

How else could it go? We would be outmatched at every angle. What we must hope for is a different possibility, one where a dominant culture meets and manages to coexist with a less powerful player. It is inordinately credulous to assume that such an interaction will unfold without some undesirable consequences, but what scenarios could we explore where we, as the less powerful participant, would do at least a little better?

One scenario we have here on Earth that at least partly fits this bill is the ongoing interaction between mainstream culture and disabled people. In every country, disabled people are systematically less wealthy, are less likely to receive adequate health care and jobs, have less freedom of movement, and are subject to more abuse than able peers (World Health Organization 1976). This kind of imbalance of power and unequal access to resources is a classic breeding ground for conflict and does frequently result in violence (Brown 2002; Sherry et al. 2019; Sherry 2010; Wilkin 2019; Evans 2004). Still, despite this wider context, interactions between these groups on the personal level are often loving and mutually beneficial.

Could we apply what we know about disability on Earth to the problem of how to survive, or at least begin to imagine, a first-contact event? Disability studies offer a set of models (sometimes conflicting, sometimes overlapping) of how humanity has come to think about disability (Davis 2017; Retief and Letsosa 2018; Camble and Oliver 1996; Nielsen 2013; Williamson 2019). They are, by and large, a disheartening set of observations on humanity's steady propensity to get things wrong—to repeatedly act out of self-interest and fear rather than love and compassion. Still, they do describe a way in which a dominant culture and a less-powerful culture have managed to coexist (albeit sometimes uneasily) across the centuries. Disabled people and abled people do interact with some degree of ease in some circumstances, but the conflict between these groups (which is generally absorbed by the disabled community and not often recognized by the abled community) is ongoing. With a few caveats, these models can usefully be applied to the first-contact situation.

First, while we chose models that represent the most common approaches to disability, some variants and offshoots are not covered here. We also resisted the temptation to include reflections from outside the discipline of disability studies per se as these are beyond our present scope. This does place a definite western perspective on our work, and as disability studies is a young field, we trust that repeating this analysis in another generation would permit the inclusion of more global perspectives.

Second, for the purposes of exploring the models, we make a set of simplifying assumptions: that there is only one ET civilization, that only one model is active at a time, that this is the only relevant influence on behavior, and that everyone in the ET society shares this approach, that the ETs have concepts similar to God—a higher power, commerce, and charity, where these apply, and that the goal of human-ET interchange would be an ongoing friendly and mutually beneficial interaction. This is quite a bit to assume, but we do this to make it possible to isolate and meaningfully discuss the chosen models.

Finally, we explore these scenarios with the disabled participant playing the role of current humans and the abled participant standing in for the extraterrestrials. By this, we do not intend to deny the fact that there are indeed circumstances when disabled people do wield social and economic

power. Through the centuries, individual disabled people have held almost every conceivable position in society, including soldier, doctor, explorer, sailor, politician, teacher, religious leader, parent, athlete, business owner, farmer, and criminal. However, such individual success stories are noteworthy because they are unusual, the result of exquisite combinations of perseverance, talent, luck, and opportunities brought about by advancing technology and the intermittent softening of some of the harsher socially imposed limits on the disabled populace.

Note that in this paper we will be using “identity-first” language, rather than “person-first” language. That is, we will say “disabled person” rather than “person with a disability”. The choice is not politically or socially neutral. Identity-first language is coherent with the social model of disability (Consult [Brown 2011](#); [Vaughan 2009](#)), while person-first language is often required by professional journals in rehabilitation, medicine, and many of the social sciences. As the social model reflects the authors’ philosophy, we use identity-first language here, while acknowledging that other disabled people may choose to identify themselves in other ways.

Models of disability and their implications for the first contact.

2. The Religious/Moral Model: Part 1

The Lord will smite you with madness and with blindness and with bewilderment of heart.
(2 Samuel 4:4)

Perhaps the oldest conceptualization of disability is the religious/moral model in which present disability is a just punishment for past or even ancestral behaviors that violate religious, moral, or social taboos, i.e., sins ([Pardeck and Murphy 2005](#); [Henderson and Bryan 2011](#)). There is no way to readily determine which moral rule was broken or even who in the person’s family committed the offense, but there is an implicit understanding that “more severe” disabilities (such as full blindness or quadriplegia) must have resulted from something especially prurient. “Afflicted” people (and sometimes their families) may be ostracized by the righteous, upstanding community. They are cast out as not only potentially physically contagious but also spiritually corrupt and worthy of contempt, this judgment occasionally mediated by small, ostentatious doses of pity by people who consider themselves forward-thinking or merciful. On the individual level, this can result in violence (particularly infanticide), but often social and economic isolation suffice, as long as the afflicted remain marginalized.

Since the just punishment of God has already been meted out, there is little the community needs to do beyond keeping a prudent distance and admonishing the afflicted to repent. Optimists might determinedly imagine that this belief system is passé, but thousands of people living with HIV provide clear examples that the idea of “God’s wrath” is alive and well in some corners of 21st century Christianity ([Olaore and Olaore 2014](#); [Petro 2015](#)). Under these circumstances, there is no chance of obtaining employment, equal education, or free access to society.

If ET were to view humans as “afflicted” in this way, the simplest solution for them would be to avoid contact with Earth in the first place, creating a new and intriguing explanation for the Fermi paradox placing Earth more or less permanently on the “do not visit” list. Extraterrestrials would approach Earth, make the determination that humans are off-limits, and move along. It is, of course, also conceivable that extraterrestrial zealots would decide to do “God’s work” by eradicating humankind, as a means of cleansing the galaxy of infidels and heretics. Although this hardly seems worth the bother considering the distances (and presumably the costs) involved, human religious extremism, at least, does not appear to be sensitive to these kinds of economic issues. There are several good reasons, therefore, to hope this is not the way things go.

3. The Religious/Moral Model: Part 2

Jesus answered: “Neither hath this man sinned nor his parents: but that the works of God should be made manifest in him”. (John 9:3)

Still holding to the perspective that disability is caused by a supernatural power, the same “affliction” can be explained as a special (if somewhat peculiar) blessing.

Disabled people (and, once again, sometimes their families) are understood to be chosen by God to withstand the disability and thereby gain patience, courage, and (usually) admirable docility through suffering (Niemann 2005). They are inspirational, a rhetorical and sometimes literal point of comparison used to alternately shame and motivate able-bodied people to “do better” (Young 2012). These chosen ones are supposed to draw goodness to themselves and through their suffering manufacture, if not happiness, at least an abiding sense of divine joy. Crucially, they are vehicles through which the power of the almighty may be revealed, but this special status rarely translates into anything remotely like equal access in the secular sphere. As symbols of virtue, endurance, or wisdom, they remain outside the mainstream, ill-suited for ordinary activities.

Once again, some might consider this model of disability to be somewhat antiquated, but the lived experiences of disabled people provide ample evidence that it is alive and well. Encouraged in their charism by advocates of the “prosperity gospel” (such as Wilkinson 2013; Roberts 1966), many people who adhere to this model of disability believe that healings will occur and that disabled people will be the vehicle for God’s mercy manifesting on Earth. Rose (2019) provided a description of how members of the public frequently approach disabled strangers and offer to pray (indeed, sometimes insist on praying) for their healing as a manifestation of God’s mercy and power. The first author can attest that this is not at all unusual, having herself been confronted many times by determined evangelists on the street, on college campuses, and on public transportation.

If ET conceptualizes humanity as “blessed” in this way, our interactions would be extraordinarily difficult. As channels of potential divine expression, we might gain some access to ET society, but in a severely compromised manner. Many might want to meet a channel of their God’s goodness and would likely feel called to protect and even admire such individuals, but they are not expected to be friends or colleagues. It might also be considered unnecessary, or even heretical, to interfere in Earth society even where such interference might bring benefit. This would protect humanity from direct harm caused by ET but might make it difficult for us to secure economic, technological, or cultural gain from such interactions with their advanced civilization. Once again, it seems like this would not work to our advantage.

4. The Charity Model

No one would remember the Good Samaritan if he’d only had good intentions—he had money as well. (Thatcher 1981)

A more secular approach to disability sets aside the religious aspect of causation and focuses on a benevolent (sometimes fully humanist) reaction to the perception that disabled people are profoundly unfortunate. If human beings are ethical creatures, it is incumbent on the community to respond benevolently, and the giving of alms and caring for the less fortunate is a secular as well as a religious obligation. The mandate is for a culture of care-for which disabled people are reasonably assumed to be grateful. It is given that the recipients will accept charity; to do otherwise would be churlish if not perverse.

Wrapped up in these perceptions is the unspoken assumption that disabled people cannot, and should not be expected to, arrange for their own material needs (Retief and Letsosa 2018). They are also not expected or permitted to specify what those needs might be; the benefactor is assumed to know what to give, and the recipient is expected to cooperate. In this case, disabled people are not understood as specifically created for the purpose of receiving charity, but charity itself is viewed as a communal good—as long as its object remains reasonably worthy.

If ET operates from a charity model, we might initially find ourselves quite satisfied with the onslaught of resources. We might benefit from a cleaned-up environment, improved medical care, and the end to violence at all levels. Eventually, though, as we progress and perhaps after the initial euphoria fades, we may find ourselves profoundly frustrated by our role as eternal children, never

perceived as equals. Furthermore, as recipients of galactic charity without the mitigating factor of also being somehow blessed, we could well find ourselves rebuffed, abandoned, or punished if we are perceived as ungrateful or if we are eventually deemed unworthy for some reason.

5. The Medical Model

Impairment is defined as any loss or abnormality of a psychological or anatomical structure or function. Disability is defined as any restriction or lack of ability resulting from an impairment to perform an activity in the manner or within the range considered normal for a human being (World Health Organization 1976).

Since early humans began the hunt for medicinal herbs, we have naturally searched for ways to cure diseases and lessen pain (Porter 2004). When progress is made, people are relieved of some of their unnecessary suffering. Classifying disability as just one more kind of illness, doctors have arrayed themselves against disabilities of all kinds. In the medical model, the problem disability is purely physical, and experts with the right kind of knowledge can and should work to cure it (Olkin 1999). Doctors, psychologists, social workers, teachers, therapists, and others become the experts, and the goal is to transform the disabled person into a non-disabled person, for their good and for the good of all society.

Of course, the disabled person is naturally expected to submit to whatever treatment is deemed necessary by the experts (Thomas and Woods 2003). Resisting “necessary” treatments when they are offered is perceived as either peculiar or as evidence of further pathology. Modern objections notwithstanding (Pfeiffer et al. 2003; Wells-Jensen and Wells-Jensen 2019), this is a widely accepted perspective. Based as it is in science and in Western notions of objectivity, this is perhaps the model that feels most natural to most people. This trope is taken up by various science fiction authors who affirm the wisdom of eliminating disability with everything from high-tech prosthetics (cf. the “blind” Star Trek engineer Geordi La Forge who functions as fully sighted) to full-body transplants (cf. the wheelchair user in Avatar, Jake Sully, whose consciousness is transplanted into an alien body).

It is quite possible to imagine that an alien civilization, with a superior understanding of biology or equipped with other means of artificially extending life and modifying bodies, would think it obvious that humans need, and would welcome, various “treatments”. We might find some of this very pleasant indeed, as disease, pain, and perhaps even old age are eliminated.

On the other hand, one might imagine dystopian scenarios where humans are forcibly reconstructed as immortal machines or new sensory inputs are added and offending senses removed, as our bodies, senses, and even minds are reconstructed to meet alien standards of ableness. Refusal to participate might cause firm, paternal intervention as noncompliant humans are forcibly transformed “for their own good”. After the possibility that the entire Earth would be destroyed as a hotbed of heresy, this is perhaps the most ominous of the explorations so far.

6. The Economic Model

Nothing is more important than your health ... except your money. (Feregi Rules of Acquisition 1993, #23)

Disability can be viewed as an economic problem to be solved, the key to which is labor. In the economic model, everything hinges on estimations of a person’s ability to work and how to construct public policy around the problem of citizens who do not “contribute their share”. Opinions that those citizens themselves might hold on the matter are of some interest, as there is no intent to do harm, but the important questions are practical ones. Assuming that a disabled person will work less, or less efficiently, than others, who will compensate the employer? Assuming this same person still needs to eat, who will provide the worker with compensations for their lost wages? Is it more economical to allow disabled people to stay at home, presumably supported by family, or would it be more efficient to organize government or for-profit facilities to house them?

There are several unanswerable questions to ask before we would know how an economic model of first contact would affect humanity. What kind of economy could be at play among or within advanced civilizations? What jobs would there be, and could humans do them? As one of the least technologically advanced civilizations, is there anything we can do that could not be more efficiently done by machines or any service we could provide that could not be provided elsewhere for less trouble? What would happen to us if we refused to work, or if we simply were not needed among beings whose culture was millennia more advanced than our own? Assuming there is a galactic economy, what would become of humankind if we could not participate?

Is this, perhaps, another solution to the Fermi paradox: we have been appraised and found functionally worthless? It is possible that the economic model might motivate interplanetary slave traders who would cross interstellar distances to take the labor they wanted from us without recompense, but again, given the distances and the expense of the journey, this hardly seems profitable—and this is all about profit. It is also difficult to imagine why and how enslaved humans could provide any value that would not more easily be procured through the use of machines.

7. The Social Model

No amount of SMILING at a flight of stairs has ever made it turn into a ramp, and no amount of standing in the middle of a bookshelf and radiating your POSITIVE ATTITUDE is ever going to turn all those books into braille. (Young 2012)

Among the more recent models, and the one favored by disabled rights advocates, is the social model of disability. While acknowledging that bodies are different and that people do possess different abilities, this model locates the problem disabled people face not in their bodies or in their failure to believe, act, or work correctly, but in the physical and cultural constructs in which they must live.

Able-bodied people organize their lives and their cultures in ways that are convenient for them. This becomes obvious after just a few moments of reflection: since humans cannot fly, doorways are built near ground level rather than on rooftops. But because most people can walk up flights of stairs, stairs are everywhere. Since we have (as compared with other mammals) an appallingly bad sense of smell, we do not rely on our noses to identify products in the grocery store. Instead, we use pictures and printed words on the packaging to tell us what is inside, effectively replacing input from one sense that does not serve us well with another. Since we cannot shout loudly enough to be heard even throughout a single large building, we have invented loudspeakers and vast, intricate telecommunications systems to carry our voices electronically where we want them to go. None of these things is inherently bad; they have brought us convenience and solved some of our pervasive problems.

They become problematic, however, when it is taken for granted that they are the natural way that things are done and when alternatives are eliminated. The problem of disability in the social model is not the people who cannot climb, see, or hear; it is the built environment that will not compromise in terms of stairs, labels, and telephones. While it is not possible (and some disability activists would argue not desirable) to transform disabled people into able-bodied people, it is quite possible to change the built environment. “Universal design”—a phrase coined by American architect Ronald Mace in the 1980s—is the design of products and environments to be useable by all people, to the greatest extent possible, without the need for adaptations or specialized design, and environments constructed to be usable by disabled people are also generally more usable by everyone.

For example, a well-designed grocery-store parking lot has gently-sloping curb cuts to accommodate wheelchair users—which also accommodate shoppers with carts and parents pushing strollers. Tactile labels and food packaging that is otherwise easy to distinguish by touch would benefit not only blind people but also the sighted person who has to reach onto an overhead shelf or deep into a freezer to retrieve what they want. Announcements made over loudspeakers can also be texted to people’s phones, allowing both deaf shoppers and temporarily distracted ones to have access to the information. In these ways, the built environment, which once represented a barrier, becomes a facilitator, and everything is safer and more convenient for everyone.

Science fiction, along with depictions of various dystopias, has some exceptionally good explorations of universal design on the galactic level. Becky Chambers' Wayfarer series (Chambers 2016), for example, describes public transportation, communication, and even seating at restaurants with thoughtful details pertaining to inclusion and access of many different kinds of species with different physical and sensory needs. Alternate histories (such as Neal Schuster's *Fractile Man*) describe how environments adapt to suit different kinds of physiology.

We would be fortunate indeed if an ET civilization used something like the social model of disability when interacting with younger civilizations. Since they may well have met dozens or even thousands of such civilizations already, their physical infrastructure and their cultural norms might be quite welcoming and accessible, having stood the test of countless introductions. We might find not only a built environment equally usable by many different species with different ways of getting around and different sensory systems to guide them but also an understanding that sentient species come in a glorious assortment of physical forms—and whatever form you were born with, you are a useful and important member of society.

8. Conclusions

Using disability models as a way of examining the first contact with an advanced extraterrestrial civilization provides some new perspectives and possibilities, but it raises more questions than it answers. What, for example, would able-bodied people make of their sudden transformation to second-class status? Would they have the wherewithal and the grace to consult with their disabled neighbors for help? What trends in disability history might inform future investigations? How will this work inform the composition of future space missions? Will it become practical—even necessary—to include disabled people among early space colonists and explorers? How will living and working in space change our understanding of disability? Are there ways of examining disability that we have not considered here and what might their implications be? In our immediate context, though, perhaps the most pressing question is this: when there is no first-contact event immediately apparent, is any of this relevant or useful? We believe that it is.

Part of the work in the social aspects of astrobiology is in studying ourselves as preparation for welcoming whatever beings we may eventually meet. If this study reveals places where we can do better, then the effort was worthwhile. We can pursue positive changes such as the hopeful and innovative work being done in the theology of disability (Eiesland 1994). The religious/moral models of disability discussed above are, in fact, undergoing something of a renaissance, incorporating the voices of disabled leaders into new ways of integrating the spiritual with the lived experience of disability. We can support the work of disabled activists and storytellers whose work brings us together while it calls for social change (Kleege 1999). And we can continue to work for the political and social change that we know we need. When considering the possibilities of what ET could bring, it becomes imperative to recognize humanity's failings to truly understand what changes could be made to ensure ET reacts positively to us.

This may not change anything about what happens during or after the first contact, but it can change how we live until then.

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Article

Cosmogogenesis, Complexity, and Neo-Natural Faith in the Context of Astrobiology

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Abstract: It is fair to say that religion, and in particular the ways in which some Christian and Islamic thinkers have again begun to encroach on the domain of science (e.g., global warming, the teaching of evolution), has caused a great deal of consternation within the scientific and philosophical communities. An understandable reaction to these developments is to reject out of hand even the slightest taint of religion in these fields—a position that has now attained the status of orthodoxy, at least in the western world. This is curious on its face, given the fact that religion has clearly provided a sense of meaning and purpose for most of our fellow humans as long as there have been humans pondering such things. Moreover, it is probably not necessary, provided one is very careful what sort of faith one endorses. Thus, the basic question I wish to address here, albeit in a very preliminary fashion, is whether it may be possible to delineate a form of faith that can inspire and guide humanity without the metaphysical baggage that causes conflict with epistemically conservative disciplines like science. To that end, I examine one recent thread within cosmology that views the universe as *creative* in the sense that it is biased towards the production of ever-increasing complexity at its edges. If that is true, it gives those so inclined permission, as it were, to view the creation of complexity (including human culture and its products) as a moral good (perhaps even an imperative) without the assumption of supernatural entities with mysterious motives and goals. After arguing that there is indeed logical space for such a faith that does not impinge on the essential commitments of either science or philosophy (properly conceived) I will examine its potential use in framing some of the emerging debates concerning space exploration. The prospect of humanity venturing beyond our homeworld in the near future offers an excellent case study of this “neo-naturalism” in action for two basic reasons. First, it seems likely that such a massive and complex undertaking *needs* a motivational source beyond mere discovery and expansion. Second, a neo-natural faith may influence how we go about this, and not always in ways those steeped in more traditional approaches to religion would predict.

Keywords: neo-rationalism; astrobiology; Martian; complexity; diversity; anthropocentrism; moral; ethics; alien; life

1. Introduction

The basic claim of this paper is that there are good reasons for both science and religion to compromise on their traditional positions, as well as logical space for such compromise to result in a new kind of “neo-rational” faith.¹ As with any faith claim, the truth of neo-rationalism is not established by the empirical evidence. However, unlike traditional religions, it is specifically designed to be completely consistent with our best scientific knowledge, both now and in future. After laying out the basic motivation for neo-rationalism, I will turn to the new science of astrobiology to show

¹ I use “neo-rational” in an attempt to distinguish this from natural theology and other movements.

neo-rationalism's potential to help us think about the many social and ethical issues this field brings to the fore. To be clear: My goal is not to advocate for the adoption of neo-rationalism, but merely to invite further, hopefully productive, discussion along these lines.

I was trained as a philosopher of science and evolutionary biologist and spent the first 20 years of my professional career either ignoring religion altogether or fighting with those of its adherents who chose to get in the way of science (Smith 2012). If someone had suggested to me just 6 years ago that I would be putting forward a faith claim as anything other than a joke, I would have found this amusingly ridiculous. But it's hard to predict one's intellectual development and my work in astrobiology has caused me to reassess many of my previous positions, since it is simply not possible to contemplate the possibility of life beyond Earth without treading on ground traditionally reserved for faith. My work in this new field has brought me into contact with many theists and fostered some truly illuminating discussions. For example, a rabbi once asked me why I chose to make reason rather than love the *sine qua non* of moral value (something I am still pondering) and I have been impressed with the highly abstract concept of God expressed by some Catholic theologians working on the search for alien life. From such experiences, as well as my own personal exploration of Buddhist thought, I have come to the conclusion that faith traditions can do much to enrich science. No doubt this revelation is underwhelming to the readers of this particular journal, but I submit that the fact it took me so long to learn this simple truth says a lot about the dysfunctional nature of the discourse between science and religion at present.

Elsewhere, I have written about these ideas for social scientists (Smith 2015) and the physical scientists and engineers who compose the bulk of the space science community (Smith Forthcoming), but here my aim is primarily to address the faith community. This is a new experience for me, however, and thus I must beg the reader's indulgence with what will undoubtedly be many imprecisions and oversimplifications. If, despite these shortcomings, the tentative ideas I put forward here inspire further discussion and debate, the experiment will have been a success.

2. Where Science Goes too Far

Though my primary target here is not the scientific community, I want to briefly outline some of the points I have thrown in their direction. Scientists like to believe they are engaged in an objective search for truth about the natural world and that their work is free of the taint of unsupported assumption. While I certainly agree that science is a uniquely powerful tool for uncovering natural truths, it is simply not true that it sidesteps all philosophical assumptions that might tempt someone to use the term "faith". Consider that science is simply not possible without the assumption that the world is a *kosmos* (a system which can be understood by human reason) and also that science is up to this task. There is, in principle, no way to establish such a claim empirically, but it is absolutely integral to science as there would be no point in dedicating one's life to explaining the inexplicable. More technically, science is an inherently *inductive* enterprise and, as such, suffers from the famous *problem of induction* (Henderson 2018). I do not wish to take up space here recreating this argument in detail, so will just jump to the punchline: scientific induction is not logically possible without the assumption that the world we observe today is representative of the world everywhere and always. Since that assumption simply cannot be supported using the methods of induction, science is therefore reliant, *in principle*, on faith of a certain sort. This is really not a controversial point, though few scientists appreciate its significance.

Some radical theists make much of this kind of argument, claiming that it shows science is ultimately just another form of religion (Behe 1996). While this is true in a sense, it is also quite misleading. As Immanuel Kant argued decisively (Williams 2017), human reason will never get very far without making *some* assumptions—where would we be if, for example, we refuse to believe that deductive logic is reliable - how could we ever establish the validity of logic without the use of logic? On the other hand, science is careful to adopt only the *minimal* set of assumptions it needs to make sense of the world around us. It is thus a religion only in the sense that *all* human attempts to explain

are religions, and is quite different from traditional religions, which are much less circumspect about the faith claims they allow. Put another way, the difference between science and religion is not the existence of what might be called faith claims, but rather their nature and extent.

The bottom line is that, while science is the best tool humans have discovered for revealing truths about the natural world, it is ultimately merely an extremely useful *heuristic*. It cannot, in principle, provide all the answers humans are driven to seek. There is absolutely nothing wrong with this, even if scientists who do not understand the limits of their own discipline are apt to become defensive on this point—as when prominent scientists disavow all faith claims as inconsistent with science (Dawkins 2008). While the scientist is well within her rights to oppose a specific faith claim that conflicts with scientific evidence, or to highlight the lack of evidence for faith claims in general, or to warn about the indirect threat that faith in the supernatural can pose to scientific methods; disavowal of *all* faith claims requires one to go beyond the available evidence. In essence, the rejection of faith *in general* is ultimately a different sort of faith claim.

3. Where Religion Goes too Far

Unlike science, religion is explicitly focused on the big questions and has no problem with faith claims. Indeed, this is the central difficulty with religion, at least how it is traditionally thought of in the West: it has no problem with faith claims, though it should. The danger of faith claims is not that they are necessarily wrong. The real difficulty is that believing in things which are, by definition, disconnected from evidence ensures such claims will multiply in unmanageable ways—if it's legitimate to believe one thing without sufficient evidence, why not another? Moreover, traditional religion is, unlike science, largely in the business of building a *social* movement, not an epistemic system. To appeal to the broadest audience, religion collectively tends to adopt a permissive and inclusive view towards faith claims of every possible stripe. This dynamic is exacerbated by the fact that religions tend to rely on sacred texts that cannot simply be rejected (for political reasons if nothing else), even when educated believers come to see them as outdated. So, while the believer has a point when she suggests the scientist must examine her base assumptions, the scientist also has a point that it's hard to take religion seriously when it makes little concerted effort to disassociate itself from its most problematic claims.

I don't mean that there are no specific religions that can be endorsed by reasonable people, or more specifically that it's impossible to be a believer and also practice good science. But most religions incorporate belief in supernatural beings and forces as integral elements of faith. Even those which do not, such as traditional Buddhism, are still religions and thus have a tendency to evolve in this direction (as evidenced by the growing popularity of Tibetan and Pure Land variants). This is something that science simply cannot countenance because of its corrosive effect on the scientific enterprise. The bottom line is that, to the extent supernatural "explanation" is considered legitimate, the motivation for doing the hard work of scientific investigation is diminished—why spend multiple lifetimes attempting to answer questions that can be answered with supernatural shortcuts? Moreover, while it may not be strictly necessary for this to occur, history seems to establish that, once supernatural forces are accepted, metaphysical claims tend to proliferate in ways that pose major problems—especially but hardly exclusively for the scientific investigation of the natural world. This is the real crux of the dispute between science and religion—while science cannot completely avoid its own empirically unsupported (faith) claims, it simply cannot countenance supernatural explanations of the natural world. To be clear, this is a methodological necessity rather than a metaphysical one—it's not that such forces are not possible,² simply that accepting them without sufficient evidence undercuts the scientific heuristic in a fundamental way.

² As I tell my students, it is not difficult to get a philosopher to admit that almost anything is *possible*, but that's just the beginning, not the end, of the conversation.

If science already involves faith claims, and not all such claims pose the kinds of problems that supernaturalism does, then it seems there is logical space for a compromise. So below I put forward a neo-rationalist faith that might allow us to have our metaphysical cake and eat it too: providing a broad basis for human meaning and purpose, while still allowing rational investigation of the natural world free rein.

4. A Creative Universe?

Before we discuss the nature of that compromise, let's consider some important recent developments in science that help motivate it. There is a very old tradition (in both science and religion) which views the universe as a system which generates increasing "complexity" over time. It's not difficult to tell a compelling science story along these lines:

As the universe cooled following the big bang, fundamental particles (e.g., quarks, leptons) came into being, which then joined to form larger subatomic particles (e.g., electrons, protons), which in turn came together in atoms. Atoms formed molecules, which aggregated under the force of gravity to produce large scale objects (e.g., stars, solar systems, and planets). Some collections of specifically situated molecules (e.g., organic soups on the surfaces of planets) transitioned into autocatalytic systems, which manufactured new chemical compounds (e.g., complex organic molecules). Some of the resulting chemical systems transitioned into living systems subject to evolution by natural selection and, in the fullness of geological time, evolved into excruciatingly complex ecosystems. At least one such ecosystem gave rise to intelligent beings and their attendant social and cultural systems. These cultural systems exhibited new dynamics via cultural evolution, which eventually led to the development of science, religion, and the kinds of conceptual debates that are published in professional journals such as this.

There are excellent reasons to think this account is true, at least in broad strokes—the vexing question is what, if anything, we are to make of this pattern. The standard view in science is that there is nothing more we can say—this is simply the way things worked, and we do not have evidence to say anything more at present. However, there is a nascent scientific movement that thinks this pattern of increasing complexity demands an attempt at explanation even if this requires more speculative moves than science is generally comfortable with. It spans several disciplines, from physics to chemistry to information science and is so new that there is not even a shared vocabulary yet, so it goes by various names: the epic of evolution, big history, cosmic evolution, etc. (Brown 2018; Chaisson 2002; Polkinghorne 2001). The basic hypothesis is that the universe has an unknown structure which naturally manifests increasing levels of complexity over time through an evolutionary process. Recently, some biologists have provided material support in the form of a candidate for the first true natural law in biology: the zero-force evolutionary law, which predicts that increasing complexity is a universal, and entirely predictable, property of all evolving systems, even in the absence of natural selection (McShea and Brandon 2010).

To be sure, the extent to increasing complexity, either for the universe in general or for living systems in particular, is a real phenomenon at all, much less one that can or should be explained, is debatable. But for our present purposes, it suffices to say that this *creative universe hypothesis* is at least perfectly consistent with the facts as we know them (Barrow and Tipler 1988; Conway-Morris 2003; Smith 2014). If this hypothesis is correct, it means that the universe produces the kinds of complexity we see all around us, including our scientific culture, in a perfectly natural fashion. This is especially important because one major motivation for supernatural beliefs is the feeling that the complexity we see in our universe requires a supernatural *designer*—an argument the proponents of intelligent design creationism in particular have made much mischief with (Pennock 2001). But with the complex universe hypothesis, there is no more need to postulate supernatural forces to explain our existence than to explain the formation of crystals in a supersaturated solution—under the right conditions, such things happen spontaneously. At the moment, it's fair to say this hypothesis is on the speculative edge

of science—in particular, there are a number of empirical and conceptual problems that have yet to be resolved. To illustrate, I will briefly outline two sorts of challenges in need of further analysis.

The first issue has to do with the meaning of “complexity”. Complexity is complicated. We all have an intuitive idea of what complexity means when we say the universe seems to be getting more complex, which is what causes us to nod approvingly as we read the story about the unfolding of a complex universe above. However, it is extremely difficult to cash out precisely what is increasing, particularly if we demand that our definition allow for scientific testing. Scientists who discuss complexity trends thus tend to impose an operational definition that suffices for the study at hand but does not fully capture our intuitions. For example, the Shannon–Weaver notion of “information” is well understood and can be measured in concrete ways (Shannon and Weaver 1949), but it’s not really what we mean when we say the universe is becoming more complex. The basic problem is that Shannon–Weaver has no way to distinguish between important and trivial information, so we can easily construct an information dense structure by, say, throwing a handful of pebbles on the ground. This problem is still unresolved, though recently the idea that we should not focus on static complexity so much as the capacity of a system to *generate* complexity over time has been gaining ground, especially with respect to living systems (Joyce et al. 1994; Smith 2018).

The second issue has to do with how science should *interpret* a trend if one could be established. It is certainly possible to identify a trend without explaining it. A thoroughly empirically minded scientist might thus say, “We just happen to live in a universe which just happens to become more complex—so what? Anything more you might wish to make of this will go beyond the evidence and is thus no longer science”. While it is true that we can interpret this as simply a brute fact about the universe, it is also true that it cries out for explanation—in particular, an explanation for the complexity around us seems precisely the kind of thing that could ground a sense of *meaning* in an otherwise cold and impersonal universe. True, science is not traditionally in the business of finding meaning, but at best this observation establishes that science should remain neutral on such questions, not that such speculation is inappropriate in general.

Another way to put this point is that science should not make the extreme rationalist claim William Clifford (1877) put so famously, namely that: “*it is wrong always, everywhere, and for anyone, to believe anything upon insufficient evidence*”. It’s one thing for science to insist that scientists must not give in to the impulse toward unfounded belief when they are acting as scientists, or even that others should refrain from unfounded beliefs that will indirectly impact science’s progress, but it’s another thing entirely to insist that we should never, under any circumstances, accept such beliefs. If nothing else, such a strong admonition is simply not possible to follow, given that our curiosity will always outstrip our knowledge. The reason scientists so often go too far here is that they have failed to grasp the basic nature of their own discipline: science is a very powerful heuristic for exploring the natural world, but it is not an ultimate arbiter of truth. If we are clear about that, then we are free to go beyond scientific evidence as long as we acknowledge what we are doing and take care not to damage science in the process. So, if one chooses to overlay the fact of increasing complexity with a faith claim that supports a sense of purpose and meaning, science should have nothing to say about this one way or another.

Of course, it’s important to keep in mind that a defense of the possibility of a scientifically neutral faith claim is not a defense of *all possible* faith claims. But science can’t be about refuting *all* faith claims, since it incorporates some of its own. Therefore, a thoughtful scientist should focus on two key questions:

1. Is this faith claim *useful* for some legitimate purpose (scientific or otherwise)?
2. Is this faith claim *consistent* with science (directly or indirectly, now or in future)?

5. Neo-Naturalism

Thus far, our discussion of faith claims has been rather abstract, so let's get specific. I wish to suggest that there is logical space between religion and science, as traditionally conceived, for a neo-natural faith based on two central beliefs:

1. The creative universe hypothesis is correct
2. The complexity thus created is morally *good*

As discussed above, the first is a perfectly legitimate scientific hypothesis, if a speculative one. The second is a *normative* claim which deals with non-empirical values and thus not the concern of science per se. That also means it's not *inconsistent* with science, of course. Certainly nothing compels us to believe either claim—doing so is a choice we are free to make or not and thus an act of faith in the most general sense (belief in things for which there is inadequate evidence).

If we are not compelled to believe these claims, why should we? The reason is deeply pragmatic: because doing so opens the door to deriving meaning and purpose from the natural universe. If the universe creates complexity and this is good, then perhaps we should adopt a sense of *reverence* for the universe in general and its complex creations in particular. Such a view also provides at least a broad guide for human action: all else being equal, we should strive to preserve and foster complexity. Of course, providing meaning and purpose is not a traditional concern of science, and thus scientists are within their rights to refuse to get involved. On the other hand, if they go this route, they should not be surprised when others stubbornly seek such things elsewhere.³

Unfortunately, both sides tend to present this as a zero-sum choice. In general, traditional religions are focused on meaning and purpose, so favor faith claims over empirical evidence. When those claims embrace supernatural claims, they should expect many to react by adopting a view of science that rejects all faith claims. Traditional science argues that natural truth is what matters, so favors empirical evidence over faith. If that means that no claims capable of supporting meaning and purpose are ever sanctioned, they should expect many to react by choosing the time-honored alternative of supernatural religion. In other words, by refusing to countenance a middle ground, the two sides ensure a continuing zero-sum struggle⁴. To paraphrase [Berkeley \(1734\)](#): "*they first raise a dust, then complain they cannot see*".

Neo-rationalism, on the other hand, is explicitly designed as a middle ground between these two warring camps. But it does require each side to compromise on some of its traditional positions, which means it will inevitably encounter the problem all compromises face—to be opposed by both extremes. Science must come to appreciate its own basis in faith and eschew the extreme position that it is improper to believe in *anything* for which there is insufficient evidence. Of course, it's perfectly fair to insist that we assess faith claims first and foremost in light of their consistency with the scientific enterprise, since science clearly provides a service of incalculable value. But if a *particular* faith claim is consistent with science and provides important benefits (e.g., psychological comfort, ethical direction), then science should at the very least remain neutral. Indeed, given the consequences of ignoring critical human needs, perhaps it should consider a guarded endorsement of some of these claims. Put another way, science should consider putting at least *some* effort into providing metaphysical and ethical direction instead of focusing exclusively on epistemology.

³ Consider, for example, the spectacular failure communism encountered when attempting to eliminate faith in favor of science.

⁴ This dynamic is reinforced by the structure of the disciplines as well. For example, the author gets pushback from both science and religion publications (though in completely opposite ways) for suggesting that their approach to faith is problematic. This makes it difficult to even have a conversation about a middle that is not simply preaching to the choir, as it were.

For its part, religion must do a much better job of policing its faith claims and, in particular, eschew supernatural beliefs that are inconsistent with science. This does not necessarily mean an end to *all* supernatural belief as it is possible to accept supernatural forces - even allow them to explain very broad features of the universe—without stepping on scientific toes. For example, if one identifies as a creationist, but means by this only that the universe was created by God (rather than that God intervenes in its processes in an ongoing way), then there is little for a thoughtful scientist to complain about—at least, to the extent they are speaking *as a scientist*. But this is an unstable equilibrium that the average believer is ill-equipped to maintain, so religion must develop a robust critical culture, with specific enforcement mechanisms and processes similar to what is practiced in science, in order to police itself. There is nothing inherently wrong with faith claims, but faith itself is not a *justification* and thus all faith claims must be open to revision in light of new evidence. Should cosmologists one day establish that the complex universe hypothesis is wrong, or that its mechanism is not the right kind to support normative claims, then neo-rationalism as described here will have to be abandoned. In other words, religion must begin to take its epistemic duties as seriously as its metaphysical and ethical ones.

No matter what direction one approaches the question from, human choice is always a critical element in the creation of meaning and purpose. Empirical evidence has a role to play—indeed, a more important one than professional ethicists typically appreciate—but claims about how we should see ourselves and our ethical obligations will always go beyond the evidence. Indeed, persistence in spite of the evidence is often seen as a *virtue* of such commitments. Consider a story about the late senator Edward Kennedy: an aide approached him on the beach one day amidst dozens of star fish that had been stranded by the receding tide. As Kennedy picked each one up and threw it back into the sea, the aide asked him why, since it would not really make any difference. Throwing another one back, Kennedy observed, “It made a difference to that one”.

6. Neo-Rationalism in the Context of Astrobiology

Astrobiology is the search for life beyond Earth. As the newest scientific discipline, it has made enormous progress within just the last 20 years (Schulze-Makuch 2019). The general public is not yet aware of this, however, and still thinks of any speculation concerning alien life as the stuff of science fiction. Yet NASA’s chief scientist, Ellen Stofan, predicts that we will likely have evidence of life beyond the Earth within the next 20 years (Netburn 2015)⁵. The prospect of such a momentous discovery has focused attention on an array of social and ethical issues that the discovery of life beyond Earth would immediately raise. These cry out for more sustained inquiry—a challenge scholars beyond the confines of the space sciences are just beginning to address (Dick 2018; Schwartz 2020; Smith and Mariscal 2020).⁶

Whatever religious and ethical systems we adopt in future, expansion into space will pose fundamentally new challenges and require much more inclusive perspectives. While some traditional faiths will no doubt evolve and survive, neo-rationalism has the advantage of being specifically designed for this purpose. Consider, for example:

1. Its two main faith claims are about the universe in general and are not tied to this particular planet, much less any particular beings on it. In fact, it’s the broadest possible natural framework one could adopt, since it adopts the viewpoint of the entire universe.
2. It is, and will continue to be, completely consistent with our best science.

To flesh these claims out, let’s examine a few specific issues that have long occupied ethicists. First, there is the problem of anthropocentrism—the belief that humans have *unique* moral value *simply*

⁵ To be sure, some scientists think this is overly optimistic, but the point here is simply that there are good scientific reasons to make such claims.

⁶ For example, the author is currently president of the *Society for Social and Conceptual Issues in Astrobiology* (SSoCIA), which is working to create a highly interdisciplinary community of scholars to examine these questions.

because they are human. That this has been a common view even amongst sophisticated ethical theorists for most of recorded history. However, one would be hard-pressed to find a secular ethicist these days who would actually defend this position, largely because they accept the natural account of human origins which makes humans simply one of many different lifeforms, all of which share a common history. In religious ethics, the situation is more complex, since for some it's an explicit article of faith that humans were specifically created as morally unique. But despite this, modern religious ethicists are far less willing to assert strong anthropomorphic views of moral value than they used to be. We have therefore made real progress here, though simplistic anthropocentrism remains a common view among the lay public in general, and believers in particular.

However, if one embraces the promise of astrobiology—that the universe is teeming with life—then anthropocentrism becomes (almost) impossible to defend. If humans are not simply one of many forms of life on Earth, but instead one lifeform amidst a vast multitude spread across a stupendously expansive universe, how can we continue to believe humans are truly morally *unique*? It seems at best we might claim to be members of a special club, along with all the other species which have the requisite moral essence (whatever that may be—intelligence, sociality, etc.).

Discovering life on another planet would force us to reconsider many other common moral assumptions. On Earth, for example, ethicists defend the moral importance of environmental protection for very different reasons. Some argue that all life on Earth has *intrinsic* (independent of any utility to humans) moral value⁷, while others argue that the moral value of life is *instrumental* (a function of their value to humans—whether in terms of the connections within our shared ecosystem or the scientific and aesthetic value humans place on them) (Zimmerman and Bradley 2019). At the moment, proponents of these very different theories of value tend to converge on the conclusion that we should preserve the environment, at least in general. To some extent, this applies to the planetary protection questions that arise when humans visit other, potentially life-bearing, worlds as well. Should we discover life on Mars, for example, most reasonable commentators support strong rules to ensure environmental protection. Whether we believe such life is intrinsically valuable in its own right or wish to preserve it for the enrichment of our scientific knowledge, we can all agree that we should take great care not to contaminate it. What happens, however, once we have scratched our initial scientific itch?⁸ Those with an intrinsic value view will argue that nothing has changed and we should continue to preserve alien life from human encroachment—a sentiment famously captured by Carl Sagan's claim that "Mars belongs to the Martians", forever and always, even if the Martians are merely microbes (Sagan 1985). But those with an instrumental approach will begin to peel away, arguing increasingly for exploitation of the resources of Mars for human ends, even if this causes harm to the indigenous lifeforms. On any world beyond Earth, there will be no shared ecosystem pushing these two sides to converge on sustained environmental protection.

Neo-rationalism, however, allows us to think about moral value in a novel way. For example, we already tend to believe in the value of diversity—all else being equal, rare and unique things are considered to be more valuable and richly diverse systems are prized (Rolston 2020). In much of the current literature, this is presented as simply an intuition. But a neo-rational perspective offers a novel explanation: diversity is essential for the creation of things which have moral value. It's not that diversity serves human interests or has intrinsic value, but instead that it is the central ingredient in evolution. Evolution simply cannot take place if there is no diversity and (as far as we know) evolution is the only means of producing complexity of the sort we value.⁹ If we choose to view ourselves as members of "team complexity" who should assist in the universal creation of complexity, we must

⁷ Though, ironically, this concept was originally employed by Kant to draw a clean distinction between humans and other animals.

⁸ Or, alternately, found ways to continue scientific study of such life while also exploiting other opportunities—for example, by creating in situ "wilderness areas" or cultivating it in the lab.

⁹ Leaving aside second order creation of complexity (e.g., artificial beings) by beings who themselves evolved.

value not just complex things, but also the *processes* which make them possible. Therefore, diversity has moral value by virtue of its central role in the process of creating complexity.

This gives us a powerful reason to value Martian microbes that has nothing to do with human self-interest. And, unlike intrinsic value theory, it also allows us to manage complex moral tradeoffs. For example, while it is certainly true that Martian microbes have significant moral value by virtue of being complex lifeforms, it does not necessarily follow that we should adopt Sagan's recommendation. For one thing, because *human* social development is also an example of morally valuable complexity, preservation of alien life may not take precedence over the establishment of a human settlement that would further social complexity. Thus, we could in principle justify interference with Martian life if there were sufficiently compelling reasons to do so (Smith 2016). I certainly don't mean to suggest that these decisions will be easy ones, merely that neo-rationalism provides a new and potentially useful framework within which to explore the tradeoffs involved in a systematic fashion.

Finally, neo-rationalism may allow us to establish a better theoretical foundation for our existing intuitions concerning the value of non-living things, especially if they are rare or unique. For example, most would allow that the Olympus Mons volcano on Mars (arguably the largest in the solar system) has moral value of some sort. While we can probably all agree that we should not destroy such things for no good reason, some will argue that they should always be preserved and others will be more willing to compromise, especially when important human interests enter into the equation. Right now, it's hard to adjudicate between these raw intuitions, but neo-rationalism might be able to help. A universe with Olympus Mons is more diverse, all else being equal, than a universe without it. Thus, we have a clear *prima facie* duty to protect it, though such duties are defeasible. Volcanoes are complex, but unlike living things, they do not have the capacity to create more complexity. Their value is static, consisting entirely of their present complexity and thus their destruction will not reduce the range of *future* complexity. From a neo-rationalist perspective, therefore, non-living things have value, but generally much less than living and other systems which actively *create* complexity.

7. Conclusions

It would be nice if we could have our metaphysical and ethical cakes and eat them too—if we could, on the one hand, retain the scientific worldview with its unprecedented ability to explain the natural world, while on the other hand adopt a wider perspective which grounds a sense of meaning and purpose of the sort religions have historically provided. This is the task neo-rationalism sets itself—developing a new perspective that fuses science and faith, revealing that we are neither accidents of an uncaring universe nor products of an intelligent Designer, but rather the creation of a natural universe that transcends our own individual existence.

Again, it is not my intent to argue for the adoption of neo-rationalism so much as foster what I hope will prove to be a productive debate along new lines. Certainly, neo-rationalism as discussed here is the merest sketch of a faith system, though it does at least show that such a system is possible. It may not survive the test of time, either because empirical discoveries force us to reject its basic tenets or because people are psychologically unable to walk the razor's edge between natural explanation and metaphysics without falling off on one side or the other. For now, however, I choose to have faith in the possibility of fruitful compromise between science and religion along these lines.

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Article

Religion, Science, and Space Exploration from a Non-Western Perspective

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Abstract: Religion and science are often set up as polar opposites in Western philosophical and religious discourse and seen as representing different epistemological perspectives that juxtapose rationality with faith. Space exploration is largely viewed as a scientific and engineering problem and, thus, has tended to set aside the issue of religion as it relates to human movement off-planet. However, as we have moved increasingly toward the idea of colonization of the Moon and Mars, social scientists and philosophers have increasingly come to recognize that human movement into space also needs to be understood as a social phenomenon. As a social phenomenon, there is an inherent necessity to consider how religion may play a role in or influence the process of human exploration and settlement of space. However, what do we mean when we say “religion?” One of the fundamental problems of thinking about the relationship between religion, science, and space exploration is that the meaning of the word *religion* is rarely well-defined. Do we mean faith-based religions such as Christianity or Islam? Or do we mean practice-based religions such as Shinto and some forms of Buddhism? This paper will explore the question of religion and science from the perspective of Japanese religions as a way of problematizing the manner in which we think about and define religion as it relates to the practice of space exploration.

Keywords: Japanese Buddhism; non-western religions; space exploration; science

The uncertainty that is necessary in order to appreciate nature is not easily correlated with the feeling of certainty of faith which is usually associated with deep religious belief. Richard P. Feynman (Feynman 2015)

Of course, secularists are desperate to find life in outer space, as they believe that would provide evidence that life can evolve in different locations and given the supposed right conditions! The search for extraterrestrial life is really driven by man’s rebellion against God in a desperate attempt to supposedly prove evolution! Ken Ham (Ham 2014)

The tone of incompatibility between science and religion lurking in the above quotations may seem unsurprising in the context of public discourse related to religion and science in societies such as the U.S. or U.K., where there has been a long tradition of suspicion and even animosity between those who identify with religious ways of thinking and those who adhere to the scientific worldview. For most of the past century, at least, and certainly in part stemming from the challenge to Abrahamic concepts of creation inherent in evolutionary theory, a basic assumption has been that the relationship between science and religion is inevitably difficult, at best. There have been some attempts among philosophers and theologians not only to identify the differences but to look for common ground between the epistemological frames of science and religion, perhaps most notable being religious studies scholar Ian Barbour’s seminal work *Issues in the Study of Science and Religion*, which explores ways in which science and religion both diverge and intersect and which, in his later somewhat speculative work, moves from exploring the relationship to creating a typology in which religion and science move through phases of conflict, independence, dialogue, and integration (Barbour 1968, 2013). Natural scientists, too, have

explored the idea of how religion and science might be fundamentally opposed (Dawkins 2008) as well as how religion and science might intersect (Margenau 1984; Polkinghorne 1998) and scientists such as Stephen J. Gould, Carl Sagan, and Albert Einstein have engaged in variously themed commentary on religion that ranges from positive to negative viewpoints, while often still pointing out fundamental differences (Gould 2002; Sagan 1997; Hammer 2002). Physicist Neils Bohr in a conversation with fellow physicist Werner Heisenberg commented that although religion and science use different languages, with the language of religion being more akin to that of poetry, it is not necessary to split religion and science into opposing realities (Heisenberg 1971).

My aim in this article is not to enter into a discussion of the intellectual discourse related to religion and science among Western academics. Rather, I wish to argue that said discourse has relied on ethnocentric conceptualizations religion built on Western, and largely Christian, theological ideologies. An excellent example of this is found in Dawkin's book *The God Delusion*, which despite briefly mentioning that his ideas may not apply to Buddhism, constructs "religion" entirely as an Abrahamic enterprise (Dawkins 2008). A key point of my argument here is that there is a significant need among scholars interested in the relationship between space exploration and religion to interrogate the meaning of the word "religion" and to note that lack of a clear concept of what is meant by religion generates problems in understanding the nature of the relationship between religion and science as it relates to the study of space exploration.

I approach this issue as an anthropologist and ethnographer, not as a theologian nor as an historian of religions. As a result, I am primarily interested not in scriptural renderings of Buddhism, but in how Buddhism is practiced and talked about among the Japanese with whom I have worked as an ethnographer. The conceptualization of science and its relationship with Buddhism is, like Christianity, complex and would require considerably more space than possible here to explore in detail (Wallace 2003). Thus, the aim of the paper is not to go into a detailed exploration of Buddhist perspectives on science or space exploration, but to use the example of Japanese Buddhism as a way to show the problems of an emphasis on the Abrahamic concept of religion for the study of space exploration as it relates to religious beliefs and practices.

It should be noted that there are a few examples of works by scientists, particularly physicists, that attempt to explore intersections between non-Western religious traditions and science (Bohm 2005; Capra 2000; Traphagan 1994); however, there has not been significant writing among Western scholars, at least, on how non-Western religious traditions might respond to the idea of space exploration. The tacit influence of Western theological discourse and concepts about the nature of religion has significantly shaped the ways in which both natural scientists and other scholars have developed ideas related to the relationship between religion and science, which influences the discourse on the relationship between religion and space exploration (Traphagan and Traphagan 2015). As McAdamis notes in relation to astrobiology, "most research engaging astrobiology's relationship with religion has tended to disproportionately focus on Christian theology" (McAdamis 2011). This is unfortunate given that only about 1/3 of the population on Earth identifies with Christianity, which itself is a complex set of culturally and historically varied traditions and sects.

1. Space Exploration and Religion

Interestingly, several astronauts have flown on American spacecraft who did not identify with Abrahamic traditions: Ellison Onizuka (Buddhism) and Kalpana Chawla (Hinduism) are examples of two, but there have been others, including individuals who identify as atheist (McGraw and Formicola 2005). And, obviously, with the growing number of astronauts from non-Western societies traveling to low earth orbit (China, Japan, India) people are bringing non-Western religious perspectives with them into space, despite the tendency of dominant discourse in writing about religion, science, and space exploration usually defaulting to the Christo-centric worldview. The extent to which these perspectives may inform both ideas about space travel and interpretations of the experience of being in space, has not been well-developed from a scholarly perspective. This may

be a result of the fact that space exploration is largely viewed within organizations such as NASA or JAXA (the Japanese Aerospace Exploration Agency) as a scientific/engineering or systems problem within which the bodies of astronauts are integrated components to be understood and managed (Olson 2018). Hence, those involved with the execution of space exploration-related activities have tended to set aside the issue of religion as it relates to human movement off-planet, although some natural scientists such as Carl Sagan have noted the tendency of space exploration to raise religious questions (Sagan 1997). However, as the idea of colonization of the Moon and Mars has become more realistic, social scientists, theologians, and philosophers have increasingly come to recognize that human expansion into space also needs to be understood as a social phenomenon. And as a social phenomenon, there is an inherent necessity to consider the question of how religion may play a role in or influence the process of human exploration and settlement of space.

To consider this question of how religion and space exploration may intersect necessarily raises a more fundamental question: What do we mean when we use the term *religion*? One of the central problems of thinking about the relationship between religion, science, and space exploration is that the meaning of the word *religion* is rarely well-defined. Do we mean faith-leaning religions such as Christianity or Islam? Or do we mean ritual-leaning religions such as Shinto and many forms of Japanese Buddhism? Although a sharp distinction between faith-oriented and practice or ritual-oriented religions can obfuscate the fact that belief and ritual are both part of religious behavior, the balance between these varies in different cultural contexts. Most Japanese, for example, place relatively little emphasis on the element of faith in their religious lives, while placing strong emphasis on ritual—one need not believe in nor have faith in the existence and powers of deities in order to sincerely pray at a Shinto shrine. For the most part, Japanese religions do not demand expression of belief in, nor internal commitment, to the power and existence of a deity (Reader 1991; Reader and Tanabe 1998). This is unlike much of Christianity, in which it would be strange (although certainly not impossible) to claim, say, adherence to the Presbyterian faith while not believing in the existence of a god. Of course, when it comes to practice, it is difficult to sharply differentiate faith-centered from ritual-centered orientations to religious behavior, given that individuals within any tradition engage ideas of faith and practice differentially.

My aim here is to explore the question of religion and science largely from the perspective of Japanese Buddhism as a way of problematizing the manner in which we think about and define religion as it relates to the practice of space exploration. It is important to recognize that I limit my discussion only to Japanese Buddhism, which is itself different from other forms of Buddhism in that it is part of an integrated worldview in Japan that includes Buddhist, Shinto, and Confucian themes that often overlap and intertwine in the minds of Japanese individuals (LaFleur 2002; Roberts et al. 1986). Like other world religions, Buddhism is a complex web of concepts and ideologies and discussion of science takes various forms and perspectives within that web.

Two points are central to my argument: (1) the Abrahamic concept of religion is by no means an adequate framework for defining religion from a cross-cultural perspective, and (2) the idea that there is necessarily a tension or conflict between epistemological frames associated with science and religion is itself a product of Western academic practices that have tended to construct the relationship between religion and science in terms of a “warfare narrative” over the methods and authority by which truth claims are established and is by no means a necessary conclusion (Evans and Evans 2008). As Evans and Evans note, from a historical perspective, the notion of science and religion inevitably being in conflict is not an accurate representation of the discourse until fairly recently, but the narrative of religion and science in conflict over truth claims is so deeply entwined with contemporary Western intellectual discourse that it is difficult to identify perspectives outside of this viewpoint from which we can consider how religion and science are, or are not, in conflict (Evans and Evans 2008).

2. Religion and Faith

A comprehensive exploration of definitions of religion developed by Western scholars would be far too ambitious for a paper of this length, and others have explored this issue in detail (Fitzgerald 2003; Platvoet and Molendijk 1999; Tweed 2009). For my purposes here writing as an anthropologist, I am less interested in defining religion than exploring how the Abrahamic conceptualization of religion has shaped the discourse on the relationship between religion and science at least in American academic circles, where as Ecklund points out, the assumption of a necessary conflict has been institutionalized in elite universities for well over a century (Ecklund 2010) despite the fact that other ways of thinking about religion obtain in many parts of the world. However, it is worth noting that I follow Geertz's perspective that religion is best understood as a cultural system, where culture is understood as a set of historically transmitted meanings expressed in symbolic form and through which humans communicate their ideas about life, the universe, and everything (Geertz 1973). Religion and science both can be understood as cultural phenomena following this definition, albeit with, in the West, different starting points for how they tend to identify valid symbolic forms and meanings and determine the basis on which to make truth claims. As Fitzgerald notes, from an academic perspective, religion is best not thought of as an objective feature of particular societies; instead, it represents an ideological category that has been shaped by Western ideologies strongly associated with the nineteenth-century European colonization and often employed in ways that simplify and essentialize the behaviors of people living in non-Western contexts (Fitzgerald 2003).

Anthropologists have often chosen to focus on ritual rather than religion, *per se*, in part because the Western concept of religion as involving belief in deities and faith or commitment to those deities often fails to translate well into non-Western contexts. This is certainly the case for Japan, where belief and faith are not typically considered prerequisites for participation in religious activities; nor is there a sense that one need be committed to a particular "faith" that excludes beliefs and ritual participation associated with different religious traditions (Traphagan 2004). Most Japanese describe themselves as engaged in both Shinto and Buddhist practices, and it is quite common for Japanese to marry in a Christian ceremony, despite having no commitment to Christian ideologies (Edwards 1990).

In general, Japanese engage religious contexts through the practice of *omairi*—visiting or "prayer", which is performed at a variety of public and private spaces such as temples and shrines, family graves, or Shinto and Buddhist altars found in the home. Unlike Abrahamic religions, which normally require some type of commitment to belief in a deity based on faith in the existence of that deity that may be mandated by institutional powers, Japanese religions for the most part have little such expectation (Traphagan 2005). The focus of religious behavior is located in the performance and aesthetics of rituals and the ways in which Japanese normally engage ritual performance raises questions about the extent to which it is intellectually reasonable to think of religion in Japan as comparable to Western religions (Danely 2015; Traphagan 2004). Indeed, it has been noted by some scholars that the concept of *religion* is a modern invention of Western scholars and theologians and rests upon a distorted understanding of human society in which the religious and secular are understood as necessarily distinct realms of human activity (Fitzgerald 2003; W.C. Smith 1983). In the case of Japan (and other non-Western societies), the fields of religious studies and comparative religions in Western academic circles have historically attempted to characterize forms of Japanese Buddhism in terms of faith without recognizing the sociopolitical and philosophical contexts in which practices associated with those forms have typically evolved. This has led to a tendency to misrepresent Pure Land Buddhism, in particular, as being faith-oriented in a way that parallels Christianity, despite the fact that most Pure Land Buddhists in Japan engage in religious practice in much the same ways that other Buddhists in Japan do—they focus on rituals associated with ancestor memorialization and downplay the importance of belief in spirit beings or the Buddhist Pure Land (heaven) (Amstutz 1997; R.J. Smith 1974).

Indeed, the idea of *religion* in the Western sense of the word was sufficiently foreign to Japanese in the 19th Century that the term for religion in Japan—*shūkyō* 宗教—was developed by Japanese scholars to describe Western religions such as Christianity and only came to be applied to practices of Buddhism

and Shinto after contact with Western individuals such as missionaries (Reader 1991). For the most part, Japanese historically have not drawn a sharp distinction between the religious and secular realms. One can find Shinto and Buddhist altars in homes and small shrines are commonly seen nestled among buildings on city streets or sitting alone in the middle of rice paddies. It is not unusual in some parts of Japan to find a bowl of carefully piled salt outside of a restaurant, which is intended to purify those who enter and is a practice associated with Shinto. But this type of practice is not done to show that one is a Shintoist, along the lines that a Christian might wear a cross; it is simply a customary behavior found in some parts of Japan and having connections with Shinto rituals and ideas—particularly the idea that salt is a purification agent (one can also find this in sumo matches). In short, for Japanese there is no *necessary* separation between the religious and the secular and, important for our purposes here, the need or desire to identify a sharp distinction between the realms of religion and science is not an indigenous concept. The Japanese case underscores the importance of not assuming that Western categories such as faith or religion are universal or even universally linked together and also points to the fact that the concept of *religion* is not necessarily an indigenous structure to be found in all societies in some common way, but is better thought of as a product of Western cultural and epistemological frameworks that have shaped how scholars (both Western and non-Western) and others have thought about the nature of religion and, thus, the relationship between religion and science.

3. Religion, Science and Japanese Buddhism

Perhaps because the idea of a conflict between religion and science is not assumed in Japanese discourses on the world, there is only limited writing on the topic among Japanese scholars. However, there is some discussion in Japanese scholarly literature on questions related to religion and science, largely constructed in terms of Western categories or that discuss the conflict as it has been expressed within Western academic literature. One locus of thought can be found in the writings of Ikeda Daisaku, who was president of the Japanese new religion known as Sōka Gakkai, which represents itself as a form of Nichiren Buddhism in the Mahayana tradition.¹ I want to be careful in discussing this particular representation, because Sōka Gakkai has at times been viewed negatively by other Japanese religious organizations, as well as in the public eye, following its rapid growth in the 1950s and 1960s and subsequent entrance into electoral politics (McLaughlin 2012). Hence, the perspective I discuss here should not be taken as representative. Indeed, Ikeda's discussion of science and religion was developed in conversation with the British historian Arnold Toynbee, which underscores the notion of the idea of a conflict existing between science and religion as being a Western frame of reference (Toynbee and Ikeda 1976). Furthermore, despite the fact that the idea of compatibility between science and Buddhism is a fairly common trope in the modern Japanese worldview, it is easy to find aspects of religious ideas in Japan that focus on features such as supranormal deities, the sacred qualities of mountains, and the potential (magical) power of rituals to influence the world that may be seen at odds with scientific perspective within Japan (Blacker 2004; Kawano 2005; Williams 2007).

One of the key points in Ikeda's comments on Buddhism and science is that they are fundamentally compatible because, according to him, Buddhism has been oriented around a scientific perspective from its beginnings. Ikeda argues that Buddhism is essentially scientific because it is built on the assumption that our world can be understood in terms of causal relationships (Solomon 1980). Ikeda argues that in Buddhism life is conceptualized as being based on the law of causality and that although different in focus from natural sciences, it is "no different from other fields of science, in that it is also an approach to discover the universal law of cause and effect . . ." (Ikeda 1968). Ikeda moves into more

¹ Buddhism is generally divided into two distinct traditions, Mahayana, which is associated with East Asian cultures and Theravada, which is associated with South Asian cultures. There are important differences in these two traditions and for the purposes of this paper I am only focusing on the Mahayana approach as it has developed in Japan. Like other religions that have moved across a wide range of cultural contexts, it is difficult to generalize about "Buddhism" as a faith, philosophy, or ideology.

polemical arguments in which Nichiren Buddhism is presented as being superior to science on the grounds that it perceives of the world through the eyes of the Buddha (Solomon 1980). Nonetheless, the basic point that Buddhism is built on a concept of causality does capture a fundamental insight into the world that is held in common between a scientific and at least one Buddhist representation of nature.

Although Ikeda is certainly correct that cause and effect are key concepts in Buddhist doctrine, one should be careful in interpreting this in terms of its similarities to science, because the Law of Causality in Buddhism is a moral concept in which doing good or evil have (causal) consequences for one's rebirth (Yokoi 1976). However, awareness of the actions of cause and effect historically evident within Buddhism led to conclusions about the universe that also share insights with modern scientific discourse. One of these is the notion that everything is interconnected. For the Japanese monk Dōgen—one of the most important philosophers in Japanese history and founder of the Sōtō Zen school—this interconnectedness is expressed in a radical de-establishment of the notion of self and other as distinct. For Dōgen, the true self is found in the realization that self and other are interpenetrating and absolute reality is the whole of the universe as a single thing (Cook 1985). Along with this idea, Dōgen emphasizes the basic insight of Buddhism that our universe is characterized by change—things are never stable and constant. The true nature of the universe is impermanence (Cook 1985). As things interact, they continually influence other things. Human existence, such as the existence of all living things, involves an endless trip through the cycle of births and rebirths. Although there are different realms, such as the realm of hungry ghosts or the realms of heaven and hell, these are not other, final, places to which we go after death, but are simply frames of existence in this universe that we enter based on accumulated karma and can include rebirth as other life forms on Earth. Importantly, it is the failure of humans to recognize this basic insight into the continuously changing nature of reality that leads to suffering in the Buddhist worldview.

I do not have space to enter into a detailed discussion of the karmic cycle here. Rather, I want to make a simple point. Humans, in the Japanese Buddhist worldview, are not particularly special in the sense that they are in the Abrahamic traditions. They are not chosen. They are not created in the image of a deity. And for many Buddhists they are no better (nor worse) than any other being in terms of moral status or value. Humans are, however, different, because they happen to be born into a condition that allows awareness of the way the universe really is and, thus, allows one to attain enlightenment. But this is not a superior state along the lines found in Abrahamic religions like Christianity, that is a product of humans having been created in the image of their deity. For example, in Dōgen's philosophy there is a radical leveling of the universe evident in the idea that all beings, whether sentient or non-sentient, have Buddha nature or, more precisely, *are Buddha*. This concept is tied to the Mahayana doctrine of sunyata or sameness (Cook 1985), an idea that has much in common with the recognition sometimes verbalized by scientists that everything is basically just star dust, including living beings.

Put another way, there is little concern within Buddhist doctrine, as represented in the writings of monks like Dōgen, about humans being created in the image of a deity and thus being special or superior to other forms of life (and Dōgen is by no means unusual in this approach). This, when combined with a basic assumption of the intercausal nature of the universe, mitigates against the idea of a natural conflict between science and religion. More specifically, when it comes to particular scientific theories such as evolution, Japanese Buddhism has no necessary problem because it already assumes evolution in its basic doctrine that everything is always changing through causal interactions, an observation that includes humans and everything else in the universe. Another way to think about this is that the universe—rather than being like a path leading somewhere, which in Christianity is the end of history in the return of Jesus—is like a kaleidoscope that just rearranges the basic components inside as it turns. There is not really directionality in this worldview; it is merely change in a way very similar to the notion that evolution is simply ongoing change as a product of natural selection.

Finally, there is also a lack of the type of creation mythology in Buddhism that might generate a sense of conflict between the aims and intentions of a deity and the behavior of its created beings.

The cycle of births and rebirths is ongoing and if one chooses, the way out of that endless cycle is through practices that lead to *satori* (nirvana, enlightenment), which involves a reorienting of the mind such that one ceases to distinguish between subject and object which, in turn, leads to an insight in which everything in the universe is experienced as a manifestation of enlightenment (Yokoi 1976). This idea is quite different from the worldview of Abrahamic religions such as Christianity or Islam in that not only is time not linear—it is cyclical—there is no starting point and no endpoint at which those with a right view are saved. Seeking enlightenment is a personal choice not conceptualized as mandated by a deity nor understood as a requirement for salvation, because salvation is not relevant from this perspective (salvation and enlightenment are quite different, despite at times being conflated in western writings on Buddhism).

Despite the limited interest in the idea of philosophical conflict between Buddhism and science in Japan, it is important to point out that this does not necessarily translate into a lack of political disagreement and conflict. Ambrose notes that there have been protests by Buddhist monks against scientific laboratories that practice animal vivisection (Ambrose 2012), but this should not be interpreted as meaning there is necessary conflict between religion and science at a level fundamental differences in worldview; instead, such conflicts tend to revolve around differences in attitudes about specific moral issues such as vivisection. In fact, Ambrose notes, I think quite importantly, that “[c]ontemporary Japanese, including Buddhist clerics, are well aware of modern scientific taxonomies and perceive a clear hierarchy among humans and animals that places humans at the pinnacle of existence. And yet from an ontological perspective humans and other animals—even bacteria—are considered akin in that they are all living beings . . . In contrast to similar Western discourses [on animal rights], which prioritize the *quality* of animal life, Japanese discourse seems to prioritize the *protection* of life” (Ambrose 2012 emphasis added). Ambrose goes on to note that this perspective may be reflected in the reluctance of contemporary Japanese to euthanize pets who are experiencing serious and painful illness.

In other words, Buddhist-oriented concepts related to the value of all life in Japan, at least, have something of a leveling influence on how people think about the relationship of humans to the rest of the living world—even while recognizing a hierarchy of life forms as expressed through (western) science, there is also a tendency to see all life as valuable simply on the grounds that it is life. Humans do not particularly stand out in that way of thinking. As in Abrahamic religions in western societies, the ways in which Japanese think about and employ concepts associated with Buddhism is complex and varies among groups and individuals. What is most important for my purposes here is that Japanese Buddhism works from assumptions distinct from Abrahamic religions when it comes to question such as how religion and science may or may not be in conflict and how the nature and import of human and other life is understood.

4. Implications for Space Exploration

Perhaps the most important implication consideration of the practice of Japanese Buddhism raises is that there is no inherent conflict between “religion” and science, largely because there is no overt philosophical nor theological tension between the religious and scientific worldviews. Concern over the validity of ideas such as evolutionary theory for many Japanese, which has so powerfully characterized the relationship between science and religion in American society, does not necessarily arise as a significant problem, because Buddhism already works from a similar basic premise as evolutionary theory—that everything is always changing as different things in the world interact through natural processes of cause and effect. Indeed, in my own experience as an anthropologist conducting ethnographic research in Japan, I have often had conversations with my interlocutors in which I am asked why Americans question the validity of evolutionary theory. These questions are usually accompanied by bewildered looks and I suspect much of this has to do with the fact that for many Japanese there is no basis for seeing the religious as inherently in conflict with the scientific. Doctrine tends not to be terribly important to most Japanese, as noted above, because people tend

to focus primarily on the ritual aspects of Buddhist (and Shinto) religious activity with only limited interest or concern for doctrinal or philosophical points.

This also means that there is little to discuss when it comes to expansion of human activity into space or to the possibility of the existence of extraterrestrial intelligence. The idea often raised by those interested in the conflict between Christianity and SETI, in which there is a sense among some that the discovery of ETI poses a fundamental problem for Christianity, with its emphasis on the belief in a deity who died to save the members of the “race of Adam”, simply has little relevance in the Japanese Buddhist (or Shinto) context (George 2005).² This does not mean there are no questions to be asked when it comes to Buddhism and space exploration—one concern that has been raised is whether or not aliens can become enlightened, given that in Buddhist doctrine only humans have that capacity. However, at least in the Japanese case, it seems reasonable to argue that extraterrestrials, whether intelligent or not, represent another form of life and Japanese Buddhist ideas would simply indicate that life should be treated like any other life found on Earth.

Indeed, it is possible that the locus where Buddhism may have a significant contribution that is distinct from religions such as Christianity is in the formation of an ethical framework for dealing with life on other worlds. Capper’s survey research on American Buddhists has shown that most American Buddhists affirm a no-harm approach to living beings, regardless of where those beings reside, as well as a no-harm ethic toward the ecosystems in which they live and support for a “scriptural ethical complex regarding the taking of resource lives [as] respectfully as possible” when it comes to scientific research on other worlds (Capper 2020). Buddhism, as Capper notes, is rather vague on the ethics of killing of lifeforms such as microbes and recognizes that it is impossible for humans to live without killing such organisms, and also that Buddhism in general tends to have high regard for human life (due to its ability to attain enlightenment) even while emphasizing the need to avoid killing other life forms as a way of respecting life in general. This presents something of a dilemma in Buddhism, because it is recognized that humans, like other life forms, kill simply to survive, even while it is best from an ethical perspective for humans to avoid killing. Capper notes the comment of one of his research participants who asks who humans think they are to assume our lives are more valuable than those of microbes, and I think this idea captures a perspective on life that is found in several manifestations of Buddhism in Japan (Capper 2020).

It is important to be careful in generalizing how we think about Buddhism, or any other religion; however, because there really are many Buddhisms and even in a relatively unified context such as Japan, there are considerable differences among Buddhist sects and also between approaches to how the religion is practiced among lay people—who largely focus on ancestor memorialization—and monks who tend (to some extent) to be more aware of and concerned by scripture and doctrine. Indeed, concern over the killing of non-human animals varies across different Buddhist-influenced contexts. And in Japan, for example, while most Japanese see themselves as following Buddhist traditions, most also eat meat—including several of my friends who are monks. What we can, perhaps, say in general is that Buddhist sects maintain an ethic of concern for life that is balanced with the recognition that at times it is necessary to take life (Capper 2020; Traphagan and Traphagan 2015).

A nuanced consideration of the relationship between science and religion as it relates to space exploration in non-Western (or western) societies needs to take into account the enormous variations that exist in how different religious traditions think about questions such as the nature of science, the nature of our universe, or the relative importance of different life forms. It also must recognize and address the fact that religion is very difficult to define and is manifested in relation to cultural variations expressed in different parts of the world. The common American notion that science and religion are necessarily at odds and that this conflict must be addressed as we expand into space is by

² It is worth pointing out that while this conflict may be an issue for theologians and philosophers, it is not necessarily an issue seen as significant among the general public in the context of Western religious traditions, as noted by Ted Peters in his survey work on this topic (Peters 2018, pp. 183–207).

no means a necessary way of thinking about these two realms of human activity and, in fact, is largely a product of Western cultural traditions in which religion is based on faith and, hence, is often seen as naturally opposed to science as being based on reason (Kroesbergen 2018). In short, as we think about the ways in which religion and science can both intersect and diverge as humans move beyond low earth orbit and begin colonizing other worlds, it is important to understand that the narrative of religion and science as necessarily being in conflict over truth claims is a product of western intellectual discourse. When other religious and cultural traditions are taken into account, the narrative need not be centered on the idea of conflict between the religious and scientific realms of human thought and behavior.

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Article

The Missing Orientation

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Abstract: Humans last walked on the Moon in 1972. We not only have gone no further with in-person expeditions to places off Planet Earth, we have not even been back to the Moon. The main motive for getting to the Moon back then, Cold War competition, may have subsided, but competition for economic and scientific advantage among nations has continued, and has failed to ignite further human exploration of worlds beyond our planet. Nor has the pursuit of science, and the pursuit of commerce and tourism, in their own rights. This essay explores those failures, and argues for the integration of a missing ingredient in our springboard to space: the desire of every human being to understand more of what we are doing in this universe, why we are here, our place and part in the cosmos. Although science may answer a part of this, the deepest parts are the basis of every religion. Although the answers provided by different religions may differ profoundly, the orientation of every religion is to shed some light on what part we play in this universe. This orientation, which also can be called a sense of wonder, may be precisely what has been missing, and just what is needed, to at last extend our humanity beyond this planet on a permanent basis.

Keywords: philosophy; religion; sense of wonder; space exploration

For, after all, what is man in nature? A nothing compared to the infinite, a whole compared to the nothing, a middle point between all and nothing, infinitely remote from an understanding of the extremes; and the end of things and their principles are unattainably hidden from him in impenetrable secrecy. Equally incapable of seeing the nothingness from which he emerges and the infinity in which he is engulfed ... (Pascal 1699)

I do not recall reading or hearing any references to Pascal's *Pensées* when Neil Armstrong and Buzz Aldrin walked on the Moon three hundred years later. But I bet millions of people around the world were thinking and feeling, without reference to Pascal, how this brief, in-person visit to the Moon was slightly equalizing this endemic imbalance between the human being and the immensity of the cosmos, how Armstrong and Aldrin embodied a small but momentous step towards bringing the human enterprise into the infinite above and around us.

Ironically, such thoughts are as difficult to easily communicate and discuss as they are profound to our existence. Military superiority, commercial advantage, even scientific accomplishment are far more tangible and amenable to measurement and assessment. So, we Americans took justified satisfaction in beating the Soviet Union in the "race" to get to the Moon, which was the primary motive, all along, of the Apollo program which got us from the ground of Earth to the lunar surface. And for those Americans and people around the world who did not care all that much about American military advantage, NASA touted all the scientific dividends that our sojourns off this planet would and could bring back to us.

But science, for most people, is not as sexy or adrenaline evoking as military competition or any kind of big, international rivalry. And when our very success in getting to

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the Moon removed the military motive in getting there, because our competitor, the Soviet Union, had been so decisively defeated, the scientific motive was unable to sustain an increase or even a steady level in our progress in space, in the face of the opposing sentiment here in the United States that taxpayer money would be better and more wisely spent addressing problems here on Planet Earth.

As the decades since the 300th anniversary of Pascal's book ensued, commercial development of space exploration took hold in the United States. SpaceX (more properly Space Exploration Technologies Corporation), commenced by Elon Musk in 2002, carried astronauts to the International Space Station in 2020, signaling not only a partnership with NASA but an intended gradual supplantation in the United States of government-funded space exploration by private industry. The People's Republic of China has continued to rely on government funding, and it plans to put up a Chinese space station in 2022, and subsequently missions to the Moon with astronauts. A variety of nations have sent probes to Venus, Mars, and beyond with no people aboard.

But since people last walked on the Moon in 1972, that natural satellite has seen no visits from human beings. Neither science, nor commercial daring, nor global rivalry among the United States and its competitors has brought people back to the Moon, or to any planet or heavenly body further out in space.

This essay looks into whether that failure may be due, at least in part, to a lack of focus on, and articulation of, a motive for space exploration consistent with Pascal's vision about our place in the universe, how we humans fit in this immensely greater and largely still unknown expanse. This vision has little to do with international rivalry and commercial interests, and is not adequately addressed by science. But it is the driving force of just about every religion (see [Levinson 2003](#), pp. 99–110, and [Levinson 2015](#), pp. 1–3 for more on a religious motive for space exploration).

1. The Sense of Wonder in Religion

You will not find a word about human exploration of outer space in the sacred texts of any major religion (more specifically, none in the top 21 religions in the world in 2015 listed in descending order in [Wikipedia \(2020\)](#), from Christianity with 2.3 billion adherents to the Rastafari with 0.6 million), unless angels are literally or figuratively beings from another planet or solar system, which they most likely are not. The Vatican is not planning on sending a crewed spacecraft or any kind of space vehicle to the Moon or anyplace else off our planet any time soon, notwithstanding the pivotal role of Jesuits in science fiction classics *A Case of Conscience* ([Blish 1958](#)) and *The Sparrow* ([Russell 1996](#)). Indeed, after a conference at the Jesuit institution Fordham University in April 2018 about space travel and religion, keynote speaker Guy Consolmagno, SJ, aka "The Pope's Astronomer," mentioned that the Vatican has all it can do to fund the Vatican Observatory, of which he was appointed Director in 2015 ([Consolmagno 2018](#)). What is easily funded by NASA and similar agencies in Russia, China, and the European Union if they have the support of their respective governments and citizens, and by billionaires like Elon Musk who founded and is CEO of SpaceX, is beyond the reach of the largest church (1.3 billion people) of the largest religion (more than two billion people) on Earth: the Roman Catholic Church. So, what do I mean when I say that the affinity of religion and space travel could be the missing, untapped intellectual springboard and spiritual fuel needed to more reliably lift us off this planet and touch the infinity of the cosmos?

I am talking about the sense of wonder, which is most commonly associated with science fiction but is also in the deep tissue of religion. Science fiction itself is often dismissed as juvenile, vacant adventure, which some of it is, but that depiction misses the profundity of numerous works, ranging from Isaac Asimov's *Foundation* trilogy ([Asimov 1951–1953](#)), which explores the question of what would happen if we could scientifically and accurately predict the future, to Olaf Stapledon's *Star Maker* ([Stapledon 1968](#)) which almost could have been written by Pascal, and ultimately is itself a religious text (the *Star Maker* is the Deity).

Indeed, science fiction on its own, in written, cinematic, and televised form, has ignited abiding interests in space travel. I first became a devotee of space travel watching reports of everything from Sputnik to John Glenn on television when I was kid. But my lifelong commitment to doing what I could via writing and speaking to help lift our species off this planet was baked in for life by *Star Trek* in the mid-1960s.

But if science fiction has that power, why has it not propelled more people further into space since the Moon landing in 1969? Unfortunately, though it is appreciated and lionized by millions of people around the world, it does not have the sway and standing of religion, and its fans are far less numerous than the billions of people on Planet Earth who adhere to one or another kind of religion, or who ponder even once in a while about our place in the Universe, or wonder what it is all about.

2. The Facts on the Ground and the Truest Believers

But what evidence is there that religiously minded people, of any faith or even no particular organized faith at all, are likely to have a special, keener appreciation of the need to get off this planet and out into space?

A very preliminary study conducted in 2010 suggests some answers. For his Masters thesis in the MA in Public Communications at Fordham University, under my tutelage (the thesis subject was his idea), Frank Borzellieri surveyed over a thousand Americans with the question of whether they believed in the so-called Roswell UFO Incident, in which it was (and still is) alleged that an extra-terrestrial spacecraft crash landed on a ranch in Roswell, New Mexico in 1947. The participants were asked about the intensity of their belief, if any, in the alleged extra-terrestrial visitation, and a wide variety of demographics including their educational level, political leanings, and religious beliefs and affiliations.

The results on the religious question were instructive: The group with the highest level of belief in the Roswell incident were those who identified themselves as “spiritual, but no specific religion” (47.8 percent of that group said they thought that Roswell was very likely or they were certain it happened, and only 14.6 percent of that demographic thought that Roswell was unlikely), in contrast to the demographic with the lowest level of Roswell belief, the “atheist/agnostic” group (only 19.9 percent of whom believed extra-terrestrials were at Roswell, and 42.1 percent of whom strongly doubted it) (Borzellieri 2010, p. 45; see also his book of the same name, developed from the thesis, *Who Believes in Roswell?* (Borzellieri 2011)).

Aside from this stark contrast between religious belief and non-belief as pre-requisite or foundation for belief that a space vehicle not of this Earth landed at Roswell, Borzellieri’s survey is also significant in that people with just a “spiritual but no specific” religious belief were the most likely to believe in Roswell. Catholics clocked in next at 34.9 percent believing in Roswell, followed by Protestants at 27.3 percent, and Jews at 22.2 percent—less than the “spiritual” believers at 47.8 percent and more than the atheists/agnostics at 19.9 percent. (Hindus and Muslims each comprised only 0.5 percent of the respondents, not enough to draw statistically significant conclusions about their beliefs in Roswell.)

This, I would say, uncovers what could be a crucial aspect of human thinking and space exploration: to wit, a more general sense of wonder, i.e., “spiritualism” or in this case a general belief or orientation that there is more to understanding who and where we are in this universe than what just science can disclose, is more likely not only than “spiritless” atheism to help get us off this planet, but, to a lesser but still notable extent, the strictures of, or adherence to, any organized, formalized religion.

But does belief in extra-terrestrial involvement in Roswell—which, for all we know, may well be the US Air Force balloon crash that the authorities claim it to be—equate to support for getting spacecrafts with humans out beyond the Moon to the planets and ultimately other star systems beyond? Certainly a visit from spacefarers not of Planet Earth would provide all kinds of pressing reasons for getting out there, ranging from security and survival, in preparedness for a possible interstellar attack on Earth, to sheer curiosity.

Joshua Ambrosius's (2015a, 2015b) work directly addresses the connection between religious belief and passion for space exploration, is statistically more sophisticated than Borzellieri's survey, and in general has conclusions about humans in space that agree with Borzellieri's about extra-terrestrials in Roswell.

Ambrosius surveyed over 7000 Americans on the correlation of their religious beliefs with some seven aspects of space support: knowledge of space endeavors, interest in them, support for space funding, appreciation of the benefits of exploration, space nationalism, and optimism about future accomplishments in space. He found, and thought this most significant, that Evangelicals were "less interested and knowledgeable about space and less supportive of space exploration than are other types of Christians and followers of other religions" (Ambrosius 2015b, p. 21). Indeed, those professing adherence to no religion ("religious 'nones'") showed greater commitment than did Evangelicals to the nearly Herculean effort of getting humans beyond Planet Earth. (Again, Muslims, and in this case, Mormons, were surveyed in insufficient numbers to have statistical significance in this study.) At first glance, this might seem to contradict Borzellieri's finding that atheists/agnostics ranked lower than any religious believers. But if the "nones" or people with no professed religious affiliations include the "spiritual but no specific" religious believers surveyed by Borzellieri, then the two results of the two surveys are very much in accord. (See also Ambrosius's 2020 "reexamination" of "church and space" with a survey that shows an increase in Evangelical support for space exploration.)

And, looked at from the top-down rather than the bottom-up in rankings, Ambrosius's findings coincide with Borzellieri's in a related way: both suggest that intense or devout commitment to any organized religion is not the most likely to help physically lift us off this planet. Rather, both suggest that it is neither denial of the spiritual essence of existence (atheist) nor strict adherence to any specific, organized way of understanding that essence (follower of a major religion) that is the missing path to space. It is, rather, the sense of wonder, which apparently is deeply buried in the literalism of Evangelicalism, but closer to the surface in the symbolism of other religions.

Can it be brought closer to the surface or recovered in atheism?

3. The Challenge of Atheism and Space

It seems that there is some confusion about atheism and agnosticism. I was on a panel at a science fiction convention several years ago, discussing the then-recently published *Touching the Face of the Cosmos: On the Intersection of Space Travel and Religion* (Levinson and Waltemathe 2015). When question-and-answer time arrived, someone from the audience asked each of the panelists to identify their religious affiliations, if any. I replied that I was Jewish, culturally (meaning I enjoy the holidays and traditions with family and friends), but not theologically, by which I meant and briefly explained that on the question of God, I was somewhere between agnostic and deist. One of the other panelists then offered an opinion that "agnosticism is just a cop-out—just say you're an atheist if you don't believe in God".

I disagreed. Atheism is a flat-out denial that there is some sort of force, whether Aristotle's and Aquinas's Prime or Unmoved Mover, or continuing intervener, in the Universe. I am more of the belief that we humans may not have the capacity, even via our ever-evolving, ever-improving science, to knowledgeably answer that question, to make that choice between Prime Mover or continuing evaluator, or even evaluate the enigma of the Prime Mover, which amounts to, in effect, if the Universe began with the Big Bang, what caused the Big Bang to happen? Not having an answer to this question, and believing that science per se will never have one, either, leads me to be not an atheist, but an agnostic leaning towards deist, in which one way of describing that deity is a big question mark.

Interestingly and perhaps significantly, I would argue that such an agnosticism tending towards deism puts me more in Borzellieri's "spiritual, but no specific religion" than his "atheist/agnostic" category. But, if I had to wager real money on Roswell, I would put my chips down on it not being an extra-terrestrial port of call that went badly. To be clear, I do

think it very likely that there is intelligent life capable of interstellar travel in the Universe. But I will not believe it for a fact unless its vehicle lands in Times Square or the equivalent, on New Year's Eve or any time in which it is crowded with observant people and media.

But if I as an example with my parcel of beliefs contradict Borzellieri's specific findings about religious beliefs and Roswell, they reinforce my extension of his findings to support fervor for space exploration, and Ambrosius's findings that no religious preferences score higher in favor of space than do Evangelicals.

The gist of all of this is that appealing to people's sense of wonder as a way of igniting their acute and continuing interest in space need not be limited to the sense of wonder inherent in all religions. Religion is a good catch-all for sense of wonder—which includes feelings evoked not only from contemplating and viewing images of outer space, but by regarding objects that are closer to home, such as the Grand Canyon or even the clean-cut Palisades—precisely because religion is institutionalized in many cases and places, and ritually practiced on Saturdays, Sundays, and sundry religious holidays. But that connection of space exploration to sense of wonder can also be drawn forth in agnostics and even atheists, however focused they may be on making improvements here on Planet Earth.

4. Getting the Word Out

Many have already concluded that the lack of progress we have thus far made in getting people beyond the Moon is an indication that we will never get much further. Andrey Miroshnichenko (2013) contended that “even a manned mission to Mars is very questionable . . . the success of the space exploration was driven by the military . . . [which is] why it never really went beyond Earth orbit . . . Space exploration as a technologies development track is essentially a dead-end track. It has already served its historical purpose by creating the environment for development of computers, materials, communications.”

Even if we count the likelihood of Elon Musk's SpaceX getting humans to Mars as at least a refutation of the first part of Miroshnichenko's prediction, the pillars of his argument remain intact. The military motive is long gone, and I say this notwithstanding the recent October 2020 announcement that Musk will be working with the U. S. Military to develop a capacity to deliver weaponry anywhere in the world within an hour via a new 7500-mph rocket (Duffy 2020), or Donald Trump's much touted U. S. Space Force, which at this point is less than a year old, with a future that may or may not survive the results of the 2020 U.S. Presidential election. Meanwhile, although China is on the verge of replacing Russia as the main national competitor to what is left of the U. S. space program, the competition between China and the United States is now, thankfully, mainly economic not military. And the immediate scientific benefits of getting further out into space, never that powerful a popular draw in the first place, have already been apparently satisfied, as Miroshnichenko notes.

Connecting the space program to the sense of wonder described in this essay may be our last hope, our best and only hope for getting permanently out into space. Sense of wonder lurks in many places in addition to religion and science fiction. It of course is not lurking but paramount in the inspired people who work for NASA, SpaceX, and space programs around the world, including astronauts who have had life-changing personal experience in the cosmos beyond our planet (see O'Neill 2008). It is also an implicitly driving force in astrobiology, or the search for life and the origins of life off this planet (see Longo and Damer 2020), which has profound implications for any religion. But sense of wonder in one form or another needs to be connected to space in a much larger percentage of the billions of people who inhabit our globe. Sense of wonder is more present, certainly closer to the surface, in children than adults (Vozick-Levinson 2015; see also Freud 1913 on the aesthetic kinship of children, artists, indigenous peoples, and neurotics). The question is how to keep it there, when children become adults.

Sense of wonder is also present in philosophy, from which science emerged from its longstanding home known as natural philosophy less than two hundred years ago. Pascal was both a natural and an intellectual philosopher, which is to say in today's

parlance a scientist and an epistemologist. Galileo and Newton are considered scientists today, but in their days were natural philosophers. There of course today are far fewer professional philosophers of any kind than there are scientists, so appealing to them as guardians and conveyors of sense of wonder cannot be not a straightforward strategy for increasing numbers of people who could support vigorous space programs. But every bit helps, and philosophy has a way of attracting original thinkers, is a natural bridge between religion and science, and can help awaken the sense of wonder often dormant or ignored in workaday science.

But there are limits to where we can find, marshal, and satisfy more sense of wonderment. It is not something that remote, virtual connections and robots can fully do for us. As we have seen during the 2020 Covid-19 pandemic, distance learning, remote shopping, and digital family gatherings can save lives and are a lot better than nothing. Indeed, classes taught via Zoom or conducted through asynchronous digital forums have some significant advantages over in-person education, including anyone in the world being able to take a course with a professor in New York without leaving their homes (Levinson 2020a, 2020b). But these virtual classes lack the ineffable energy of the in-person classroom, and shopping for fruits and vegetables online does not allow the touching, hefting, and even sniffing of cantaloupes which not only my grandmother did but many discerning grocery shoppers still do (Levinson 1994a, 1994b), and nothing compares to hugging your grandchild. As for robots, they certainly can collect worthwhile samples on distant worlds and via rocketry bring them back to us. But as conveyors of first impressions of off-world encounters, real robots do not cry when they come upon exquisite beauty (Levinson 2003, pp. 122–35), and that is to their detriment and our loss. The notion that we do not need to go there—do not need to go out into space ourselves, because our digital and robotic surrogates can do it for us, and without jeopardizing human lives (e.g., Roland 1994)—is certainly true regarding risk of astronaut lives, but misses the unique dividends that only the human sensorium connected to the human brain/mind/soul (take your pick) can provide. Sense of wonder is a rare property of intelligent life, with both parts of the possessor, intelligence and life, being required.

Ambrosius (2015b, p. 27) concludes his essay with a plea taken from Jon D. Miller (1984) that “We must build upon the ‘attentive publics’ in many of the great world religions and stitch them together as we embark on the greatest project humanity has ever pursued.” The “we” means space enthusiasts like him and me, and the scientists, technicians, engineers, astronauts, and everyone who works on getting us off this planet, and in the case of astronauts and cosmonauts risk their very lives in this “greatest project humanity has ever pursued”. I of course agree with Ambrosius, but would go a little further.

We need to enlist not only the “great world religions” but people in the streets of “spiritual, but no specific religion”. We need to enlist the agnostics and atheists whose sense of wonder make them a suitable “attentive public,” people who may see their sense of wonder as different from or even opposed to religious thinking even though at basis it really is not. As Elizabeth Drescher noted and confirmed in *Choosing our religion: The spiritual lives of America’s nones* (Drescher 2016, pp. 11ff), professed atheists, agnostics, and “secular humanists” claiming no organized religion (“Nones”) enjoy “spiritual lives” as rich and vibrant as those in organized religions.

Because, whether we like to admit it or not, we are all like Pascal, largely clueless, sometimes vexed, always at a loss not just to explain but even glimmeringly understand who and what and where we are in this vast cosmos. That is what we who see getting off this planet as the best and likely the only way to begin to get a better grasp on these questions need to do: engage in conversations that connect getting out into space with the cavernous need to know inside every one of us. And because that need is already in all of us, the orientation missing for launching our species more fully and consistently and far further off this planet is not something that was never there before, but rather something that was already there, all the time, in every human being who ever lived. As religions

and science have both in their own ways recognized, the sense of wonder implicit in every revelation and discovery is an old friend who needs to be invited back to the table.

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