

Bringing Religion to the Outer Solar System

Arnold Benz

I met Samuel Vollenweider in a philosophy seminar on the Age of Enlightenment at the University of Zurich. He was a postdoctoral researcher at the Faculty of Theology, and I worked in astrophysics at the Swiss National University of Technology (ETH Zurich). We both were in our thirties, baffled and perplexed by the differences between our academic disciplines. Each of us became compelled with curiosity about the other's different view of human existence in the universe. We had lunch together once a week and bombarded each other with questions. Our discussions revolved around basic questions: Can today's science discover traces of God in the universe? Are there bridges from the old theological cosmology to modern physical theories about history and the structures of outer space? What might it mean in today's world of omnipresent science to talk about the universe as a divine creation?

Bursting with enterprise, we decided to write a book on science and religion that would not start out from history, theory, or dogma, but from firsthand experience of reality. However, writing faltered after a few initial chapters on physics. We did not find a transition into theology, but an open gap between our fields of research. Physics and theology differ too much in their understanding of reality and their methods. The big questions cannot be answered with any interdisciplinary theory. So we decided to frame our lunchtime conversations in a novel. We would not record our actual discussions, but let typical (or rather stereotypical) representatives of our guilds talk to each other.

Thus we decided that our book would not consist of a systematic or academic treatise but instead be the story of dialogues between a fictitious physicist and a fictitious theologian. A non-fiction book in the guise of a novel was the result (Benz and Vollenweider 2022). The problem was that in reality physicists and theologians hardly talk to each other and even less listen to each other. They are members of well separated communities. The knowledge of the other side is considered to be irrelevant in the own field and a distraction to the career. To overcome this hurdle, we placed the novel in a future space ship orbiting in the year 2051 around planet Saturn where the two opponents are waiting for the rest of the crew and have all the time to ask, to explain, and to object. And above all, the remoteness and solitude for days on end force them to listen to one another and oblige making an effort to understand each other. Understanding does not imply unity. None of the two is converted and changes his perspective. The theologian is not a missionary.

Seen from Saturn - the most distant planet of antiquity - and in a high-tech spaceship, ancient religious traditions have little value. The view is primarily focused on objective measurements, the immediate perception of reality, scientific observations, and possibly direct religious experience. The social functions of religion in ethics, mental health, and spiritual orientation are important but secondary.

But why should a theologian be on a deep space mission? We started out with the clumsy proposition that the theologian came on board as a stowaway. Obviously, this is an unlikely or even ridiculous scenario. The further we developed the plot, the more it became clear that we did not

need an excuse for having a theologian in the team, but that there are good reasons for including an expert in religion. Explorers to the Saturn system have to endure voyages of more than five-year duration one way, thus a total of more than ten years in a space ship of limited size. It exceeds the hardship of the sailors at the time of Ferdinand Magellan and James Cook. Both of them, and other explorers as well, included priests in the crew for various tasks, such as ritual, counseling, and occasionally for ethical questions. Will religion be on board when humans will travel to far away planets?

When humanity will spread to the outer solar system, the novel assumes, religion will spread there too. Religion will not be brought to life forcefully as in previous centuries, but will come to life naturally. Five ways are indicated in the novel how religion may spread to outer space. They are described in this chapter in five corresponding sections. Section 1 explores direct religious experiences. What makes an experience a religious experience? To be relevant in today's worldview, theology must be concerned with the basic question about the way religion relates to human experience. I believe that it is essential to be aware of how science and religion differ from the very beginning in the way they perceive reality. Sect. 2 presents the Overview Effect when seeing the planet Earth from afar. It has been related to religious feelings including thankfulness, responsibility, and guilt. Sect. 3 discusses the psychological influence of the long travel times, the solitude, isolation, and boredom, but also the potential of spiritual depth. Sect. 4 describes how religion comes into the play in the profound discussions between the astronauts, having time to listen to each other and cannot avoid the Great questions. In Sect. 5 is remembered that religion is the fundament of the social ethics in society and in particular in the conduct among the members of the crew. As it may also be the cause of conflict, religion must be handled professionally. A final section concludes how science as an objective methodology and religion as a spiritual experience may relate to each other.

1 Religious Experience in the Outer Solar System

Religion is part of the story from the beginning of the 'Mission to Saturn'. A billion miles away from Earth, religion is not only present as dogmatic assertions or Biblical narratives but first of all in religious experiences. It is for example perceived in the amazing and unexpected appearance of a hurricane in Saturn's atmosphere. The new structure on a featureless surface surprises the astronauts in their tedious daily routines in the spaceship. It happens on the day of Easter celebrated on faraway Earth and sparks a debate about the meaning of Creation.

The agnostic physicist in the novel limits the notion of Creation to gaps where science has no explanation. At the same time, he denies the reality of such gaps: future science will close them all (Benz and Vollenweider 2020: 199). The theologian on the other hand insists that Divine Creation is not a stopgap. It is not just an assumption but originates from a stunning experience, the becoming aware of something important that is graciously given (Weder 1999: 68). The experience interpreted by this pattern is not genuinely religious. The hurricane is a secular phenomenon but can be deliberately interpreted as sacred (Gatta 2004: 242).

The physicist objects the religious interpretation. He requests justification by further experience. Yet, the truth of such interpretations cannot be objectively verified, contrary to scientific measurements. The scientist is perplexed and does not understand. Obviously, religion is a completely different perspective of something science would call just a meteorologic phenomenon. There is no smooth transition or harmonization from one to the other.

The theologian in the story recognizes a general pattern in the emergence of the hurricane: A new order appears out of chaos, decay, and death. 'New from Old.' In Christian theology, the prime

example of this pattern is the resurrection of the Messiah on Easter. It is not an everyday event, but part of a new order of the world. It is - according to a traditional theological figure of thought - a new Creation. The theologian points out that in the case of the resurrection, the reality of the experience may be found supported by the radical change that the resurrection caused in the lives of the early Christians and by the astonishingly fast spreading of the resurrection message practically all over the world at that time. True is what makes sense in the long run.

In reality, several more dramatic, allegedly religious experiences and perceptions in near-earth space have been reported since the beginning of astronautics.¹ Some of them were profound and life-changing. The Apollo 15 astronaut James Irwin, the eighth person who walked on the Moon, reported that he 'felt the power of God as I'd never felt it before.' Another moonwalker, Apollo 14 astronaut Edgar Mitchell, said that on the trip back to Earth, he felt a profound sense of universal connectedness with the stars, the receding moon, our blue planet, and the vastness of the cosmos and added:

'The presence of divinity became almost palpable, and I knew that life in the universe was not just an accident based on random processes. The knowledge came to me directly (Bailey 2005: 150).'

Religious experiences in space, however, were not totally different from everyday experiences. John Glenn, an early astronaut, noticed:

'They were encounters, moreover, that were both broadly predictable and distinctive only in quality or number, not really in kind, from those available on the ground (Kendrick 2013:73).'

C. S. Lewis observed early in the space age, whether or not an astronaut found God in space depended very much 'on the seeing eye'—who that astronaut was and what he already believed (Lewis 2014: 171).

The official prime task of the theologian in the novel is studying religious perceptions and experiences. He is assigned to test the numerous reports about religious experiences in space, an environment dominated by science and technology. What happens in such religious experiences?

Becoming aware of 'knowledge' in Mitchell's report above describes a cognition process not limited to space. Contrary to scientific cognition of reality, the human is inherently involved and cannot keep at a distance. Unlike in a scientific observation or measurement, the sensation is not objective and could not have been noted by other people. Mitchell cognizes 'directly' a transcendental Presence. The cognition is immediate without being previously processed by reason. It is the way also animals cognize the world *e.g.* to orient themselves and to avoid danger (Thomas 2018: 138).

Direct or participatory (Benz 2016: 100-104) perceptions are common in human experiences and are not limited to religious ones. They include also perceptions of art, happiness, love, grief *etc.* It may be compared to a resonance between the object and the observer that takes place before rational scrutiny. The human mind participates in this kind of perception. Participatory experiences contain by definition a subjective element. The human observer is part of it.

Participatory perceptions are not exactly reproducible and barely quantitative. Are they real? They may concern a real object, like a piece of art hanging on the wall, but art experience includes a human being that reacts to the object. The reaction may be a sentiment, a feeling, or anticipation. Participatory perceptions are not compelling and – since subjective – are different for each person. Yet, they may be similar for many people. This is why some paintings get higher prices on the market

¹ Oliver Kendrick has critically reviewed religious experiences in space (Kendrick 2013).

than others. Critical reasoning is necessary to avoid subjectivism. To be taken seriously, participatory perception must be more than the purely subjective experience. It must withstand further experience. Real is what has a lasting effect and does not turn out in the long run to be an illusion.

What are the sensors for perceptions for the religious reports of the astronauts? Human perception is different from scientific measurement. The first interfaces to reality are the sense organs that have similarities to physical sensors. Human cognition, however, differs widely from scientific data analysis. Cognition includes not only brain activity, but neurons in various parts of the body, the mood of the person, emotional tensions, feelings, the prehistory and the environment of the perception. It is 'embodied cognition', a subject of recent psychology (e.g. Varela et al. 1991; Wilson and Foglia 2016). Embodied cognition helps individuals to orient themselves in the outside world, where it is important to anticipate the imminent future (Clark 2015).

Participatory perceptions of the kind of embodied cognition operate already in the animal world (Thomas 2018: 33-39). In fact, it was the archaic way of perceiving and has developed through evolution. Scientific forecast and rational analysis may be far superior in many incidences, but humans have not lost the ancient capability to perceive participatory reality. It shows up for instance in the expression to have a 'gut feeling' in a rationally unclear situation. In many cases, the gut feeling is taken to be more relevant than rational reasoning of objective facts.

Poets and writers do not hesitate to assume that more can be perceived than through science. Non-objective perceptions are essential to human existence. If they all were just illusions, human existence would be an illusion. Most scientists are realistic enough to reject such a statement. Only an ideologic physicalism questions whether 'more than science' exists. Yet, this question has become an issue in science and religion, whether consciously or unconsciously. To be clear, it is possible to talk about God only if there is more than scientific cognition.

William James in his classic treatise 'The Varieties of Religious Experience' describes a large number of different religious perceptions: mystical experience, sense of a (divine) presence, spiritual unity with the cosmos, overwhelming happiness, answered prayers, etc. Common to these experiences is that none of them is fully reproducible or objective. In all of them a person participated, who found a certain event to be relevant or even transformative. None of the experiences would objectively prove the existence of a transcendental Presence. What they unequivocally testify, James concludes,

'is that we can experience union with something larger than ourselves and in that union find our greatest peace (James 1902: 525).'

This experience of union qualifies as a participatory perception. The interpretation of the 'larger' entity with God is possible, but depends on the cultural background, the concept of God, and the belief system of the person. The Bible reports also on a large variety of religious experiences. They all have in common that none of them was an objective and reproducible event in view of today's science. However, we are told that there were participatory experiences that changed some people's life and for them these experiences were as real as reality can be. Religion will spread to the outer solar system first of all by experience.

2 The Overview Effect

The overview effect is the result of viewing the Earth from space. It is more likely than other perceptions to elicit an affective or contemplative, but not necessarily religious response. In the course of the Apollo Program astronauts could perceive our home planet for the first time from afar. Seeing the Earth first-hand to be a fragile globe hanging in the void, shielded from space by a tiny

atmosphere, was an overwhelming experience and it shifted cognitive awareness. It is known as the Overview Effect (White 1987). Although well known for centuries, imagining planet Earth in three dimensions invokes a sense of community for humanity as a whole, from which national borders and even continents appear petty. The Overview Effect was particularly experienced when viewing Earth from orbit or from the moon. Michael Collins, Apollo 11 astronaut, remembered:

‘The thing that really surprised me was that [the Earth] projected an air of fragility. And why, I don't know. I don't know to this day. I had a feeling it's tiny, it's shiny, it's beautiful, it's home, and it's fragile (Chang 2019).’

Collins continued:

‘This was a sobering, almost melancholic, sight: the Earth seemed beautiful and delicate precisely because seen from a distance it was conspicuously surrounded by yawning emptiness (Collins 2019: 385).’

The Overview Effect was not reported as a religious peak experience. The emotions were empathy, responsibility, and a sense of belonging. They are at the basis of any ethics of planetary sustainability.

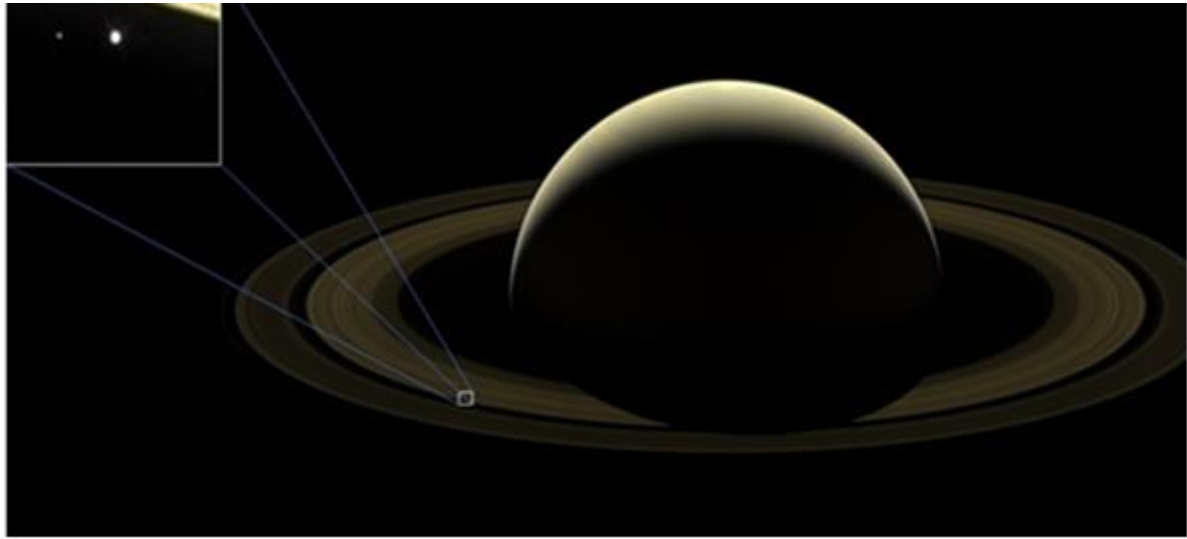
A picture of planet Earth rising over the Moon was photographed by Astronaut William Anders in lunar orbit on Christmas 1968. It became cult status and had a noticeable impact on the ecology movement emerging in the late 1960s. The picture was taken prior to the Apollo 8 crew's reading from Genesis 1,10 (NIV): ‘God called the dry ground ‘land,’ and the gathered waters he called ‘seas.’ And God saw that it was good.’ The biblical context added a religious perspective to the view from a distance of 377000 kilometers from the home planet.

The view of faraway Earth reinforces the feeling or cognition that the Earth is an undeserved gift. It is our basis of life. The planet is a lonely oasis in space, where life could arise. The Earth is, in the very long run, the only place in the universe accessible to humans where life can flourish. This unique position, reinforced by the Overview Effect, arouses the feeling that Earth is a gift to the living beings. With the metaphor of the gift, reality is interpreted as Creation. A giver, Creator, is implied. This metaphoric is clearly depicted in the second creation story of the Bible (Genesis 2:5 - 4:26): Adam (Hebrew for human) is formed from arable soil, then given the breath of life. He is given a garden with trees, a place for life. Then animals and finally a partner are given to him to enjoy life. If the universe is believed to be a Creation, it is because the universe is experienced as a generous gift (Benz 2016: 151). Mankind must behave accordingly and prove itself responsible to the gift. Here ethics comes into play in a prominent way. In the biblical story, it is the knowledge of good and evil that was the promise of the forbidden fruit. This ethical knowledge puts us in debt, because we cannot completely avoid the evil of misusing the gift of Creation.

The ethics of human activity in the outer solar system becomes significant as soon as humans or robots controlled by humans are there. The commercial use must have limits as the resources will eventually deplete. Ecotheology considers the ethical dilemma between human needs and the limitation of the associated resources. In the outer solar system the dilemma persists currently in the dangers of proliferating bacterial and viral forms of life and, in the future, in the competing interests of commercial mineral exploitation. The outer solar system may be far away from the present view and daily sorrows, but this may well change, although the foreseeable developments will first focus on the nearest objects and best return, such as the Earth's Moon and Mars.

The view of Earth from a distance resulting in an Overview Effect also plays a role in the book ‘Mission to Saturn’. The astronauts look back at planet Earth with the onboard telescope. The view from Saturn in the year 2051 triggers feelings of gratitude, but also of guilt. The language reminds of

Jeremiah's prophecies of terrible catastrophes if people do not turn back and repent. Religion will be brought to the outer solar system also as a bases for moral values and ethics.



The robotic Cassini spacecraft took this image of Saturn from the far side in 2017. *Insert:* Earth (center up) and its Moon (left) are visible through a gap in Saturn's icy ring system. The distance to Earth is 1.4 billion kilometers (Photos: NASA/JPL-Caltech/SSI/Cyclops K. M. Gill)

Distance and travel time become of paramount importance in the outer solar system. Being a billion miles away from Earth may convert the Overview Effect into a stressor causing negative physical and psychological effects. Adverse psychological effects have been predicted, in particular normlessness, a breakdown of societal norms which regulate individual conduct, and alienation from the rest of humanity (Szocik et al. 2019: 68-75). Crew members may need counsel from a clergy on board.

3. Spiritual Depth

Travel in the outer solar system will always involve multi-year travel times. The greatest obstacles to crewed space missions are human limitations. The crews will be confined for more than a decade in the small space of their ship. Their situation is similar to that of anchorites and recluses who walled themselves into small cells, or monks and nuns in strictly regulated monasteries. Religious men and women work, sleep and pray in their small hermitage. Confined to their cell, monks in the Middle Ages and also today created significant works in art, science and culture. Certainly, seclusion alone did not grant masterpieces. Spirituality was also important, stimulated by daily services in community. Spirituality and the search for God animated long times of prayer in monasteries. A strict daily structure was necessary to keep work, prayer and sleep in productive balance. Appropriate guidance is mandatory. The monastic experience is well documented, both in positive and negative senses. It has been described extensively in the literature (*e.g.*, Skinner 1999). It documents the experience of dealing responsibly and productively with a great deal of free time.

Certainly, the experiences in the monastery cannot be transferred one-to-one to journeys into the outer solar system. Not praise of God is the goal, but simply the prevention of boredom and ennui. They threaten the health of space travelers like the better-known physical dangers of osteoporosis resulting from the absence of gravity (Szocik et al. 2019; Cazalis 2021). Undoubtedly, entertainment

and cultural events can pass the time, but over the years they are not enough. Meaningful activity helps more against boredom. The astronauts of the 'Mission to Saturn' are scientists and work on their research projects and the popularization of science for students on Earth. It may be noted here that Sir Isaac Newton invented the calculus while sequestering from an epidemic.

Spaceships to the Moon were very noisy and left little room for quiet time. On journeys to the outer solar system the astronauts will have ample time to think about themselves and their relationship to God. Margret Boone Rappaport and Christopher Corbally emphasize that the spiritual dimension should be considered during long space journeys.

'We note, with some hesitation, that one of the best models for productive use of long stretches of 'quiet time' is the cloistered human devoted to a life of prayer, found in most religious orders all over the world (Rappaport and Corbally 2022: 7).'

In prayer, the person opens himself to transcendent experience that reaches beyond sensory perceptions. Feelings of hope, patience, and acceptance of the other crew members are nourished and directed by faith and religion.

Settlements in the outer solar system will be research stations or small mining outposts comparable to today's mining enclaves in Australia. In frontier communities on Earth, values stabilized by religion provide a spiritual and moral influence on a hard life-style (Rappaport and Corbally 2022: 12). The situation may also be compared to the settlement of the North American Frontier in the 19th century. The individuals who first staked their claims in the 'Wild West' remained humans in need of stability. Law enforcement, basic education, bold medicine, but also intrepid preaching were increasingly important. Eventually, value-based forces brought civilization. The explorers should take religion with them to avoid problems due to an archaic order that prevailed during the settlement of the American West. Theological advances must accompany technological progress.

With the absence of shuttles for supply and relief of the crew on duty, the mitigation of boredom and stress are major problems. The crew has to cope with illness and maybe death. Spiritual and religious issues can hardly be avoided.

In the novel, the theologian is the only person on board with an education in humanities among the group of hard-core scientists and rational engineers, a physicist, two pilots, a computer scientist, a biologist, and medical scientist. The acquired habits of emotional reticence mark the corporate style of past and present astronauts. Yet, as reported, it was possible still for the moon landing astronauts to sense some spiritual movements.

The third role of the theologian in the novel is to add a spiritual depth to the life on board and to arbitrate between the variant experiences on the spiritual level. The theologian is introduced as a trained group therapist and arbitrator and is also given the additional task of intervening in the event of any interpersonal and psychological problems. Needless to say, it is necessary to avoid conflict among the astronauts in all circumstances. Thus the theologian in the plot has an important role in the 'Mission to Saturn' justifying his participation in the journey. In future long-duration space travel, spiritual depth will be a necessity to be considered in the selection of the travelers, and a designated person on board will be responsible for it.

4 Great questions

In the storyline of 'Mission to Saturn', the person of the theologian serves as a source for injecting great questions. What is the position of the human being in the universe? What is most important in

the universe of our possibilities? What is the future of the universe? What is the meaning of it? These questions are typically what-questions, asking for goals and meaning. Religion enters life on the fictitious spacecraft of the 'Mission to Saturn' also by curiosity of the crew for such great what-questions. Science on the other hand answers how-questions: How do stars form? How did life on Earth emerge? How did humankind develop? How did the universe originate? The how-questions refer to the causal development of an object. Some religious creation stories appear to answer the how-question and then get into conflict with the scientific answer. Journeys to the outer solar system provide plenty of time to think and discuss great questions in science and religion and can stimulate abundant issues to mitigate lengthy space missions.

Humans yearn to understand the universe, its purpose and its meaning. The lively discussions are more than a time filler. The questions often arise from the scientific work of the astronauts, answering how-questions. Starting from quick answers that are often rapidly refuted, the discussions on board become more and more essential. However, they do not end in harmony. The scientist does not understand the theological arguments and remains agnostic.

In the physicalist worldview of the fictional scientist, everything in the universe can be explained by the strict laws of causality or chance. There is no room left for God. This worldview dominated by science focusses on the part of reality that is measurable and objectively observable.

Thus the fourth and most important task of the theologian in the novel is to critically question the assumption of completeness of today's worldview. There is more than science. Reality is larger than what scientific methods can perceive. Religious and other participatory perceptions reveal a part of reality that is inaccessible to science, but relevant in the daily life on a spacecraft. The theologian in the novel emphasizes a perspective where meditation and contemplation of old texts, and religion in general, play an important role.

5 Social Ethics

The social dynamics in the crews of the 16th and 17th century seafaring explorers was often dramatic. Murders, mutiny, pillage, treatment of indigenous people, and other incidents required frequent ethical decisions. They are commonly based on some social ethics. Religion is very much involved as the foundation of the legal tradition (Babie 2022). In small communities like space crews, the personal moral of particular people dominates the scene.

In the novel 'Mission to Saturn' the theologian takes an important role in the ethical decision trying to rescue the colleagues stranded on the Saturn moon Titan. Remarkably, the theologian does not content himself to reflect the ethical issues of risk and self-sacrifice, but takes an active role in the operation. Finally, it is the common effort of the scientist and the theologian who find each other not philosophically, but in joint action.

Ecological issues for the Moon are serious today as the commercial interest is substantial. Yet, the ecological questions exist: What is the balance between equitable use of resources and commercial benefit? What natural resources have to be protected for future generations? Does the natural environment of the icy moons of the gas giant planets has a value by itself to be protected forever? Religion does not provide simple answers, but the fundament, on which values may be discussed. It is important that the ethics concerning the solar system develops, before space exploitation begins.

6 Conclusions

Will religion be a stowaway on board when humanity will spread to the outer solar system somewhen in the next centuries, will it travel as a natural companion, or be invited to complement the crew? The question is posed specifically in the novel 'Mission to Saturn': Would it make sense to have a theologian or religious scientist in the crew of a space ship bound to the outer solar system? Can it be justified in a mission where every pound in take-off weight is more costly than gold? The basic question is, however, why and how religion comes to life in a world dominated by science and technology.

Here the arguments are put forward not to convince a space agency for the selection of a theologian astronaut, but to reflect the value of religion in general. Religious experiences are life-changing and cannot be arranged or planned. Yet, spirituality is innate to human beings whether religious or not religious. In this chapter it is assumed that religion has an empiric base of some form in participatory perceptions. They add another dimension to an otherwise purely mechanistical worldview. Such religion is not a rational construct, not a God of the gaps, and not a dogmatic coercion.

Religion accompanied by critical reason has several positive functions. It can be the fundament of spiritual depth or just mental sanity. It can be the source of values and ethics of the environment or of social life. Finally, religion in the form of theology, including rational thinking about faith, can be a complement to science, asking big questions and sounding critical alarms in case of transgressions by scientific worldviews.

Religion will spread with the crews to the outer solar system, since these courageous people venturing so far from home for so long will live on patience, hope, independent thinking, and on the contemplation of Great questions.

References

- Babie P (2020) Law, Religion, and Theology: A Relationship That Matters. In Religion Matters: The Contemporary Relevance of Religion (Babie P and Sarre R, eds), Springer: Singapore
- Bailey LW (2005) The Enchantments of Technology. University of Illinois Press: Champaign, IL
- Benz AO, Samuel Vollenweider S (2022) Mission to Saturn – The Story of a Debate about Science and God. The Crossroad Publishing: Chestnut Ridge, NY
- Benz AO (2016) Astrophysics and Creation: Perceiving the Universe through Science and Participation. Crossroad Publishing: New York
- Cazalis R (2021). Plants Under the Moonlight: The Biology and Installation of Industrial Plants for Lunar Settlements. In: Rappaport MB and Szocik K (eds.), The Human Factor in the Settlement of the Moon. Springer Nature 75-96.
- Chang K (2019) For Apollo 11 He Wasn't on the Moon. But His Coffee Was Warm. The New York Times. ISSN 0362-4331. Retrieved 2019-07-17.
- Clark A (2015) Surfing Uncertainty: Prediction, Action, and the Embodied Mind. Oxford University Press: Oxford
- Collins M (2019) Carrying the Fire. Farrar, Strauss and Giroux: New York
- Gatta J 2004 Making Nature Sacred. Oxford University Press: Oxford
- James W (1902) The Varieties of Religious Experience. Longmans: New York
- Kendrick O. (2013) To Touch the Face of God. Hopkins University Press: Baltimore
- Lewis CS (2014) Christian Reflections. Wm.B. Eerdmans Publ. Comp.: Grand Rapids
- Rappaport MB, Corbally C (2022) An Ecotheology for Human Settlement of the Outer Planets: Roles for Religion Beyond the Warmth of the Sun. Theology and Science, in print
- Skinner J (1999) The Wisdom of the Cloister. The Crown Publishing Group: New York
- Szocik K, Campa KR, Rappaport MB, Corbally C (2019). Changing the Paradigm on Human Enhancements: The Special Case of Modifications to Counter Bone Loss for Manned Mars Missions. Space Policy 48: 68-75.
- Thomas JJ (2018) Embodiment, How Animals and Humans Make Sense of Things: The Dawn of Art, Ethics, Science, Politics, and Religion. Dog Ear Publishing: Indianapolis
- Varela FJ, Thompson E, Rosch E (1991) The embodied mind: Cognitive science and human experience. MIT Press: Cambridge USA
- Weder H (1999) Kosmologie und Kreativität. Evangelische Verlagsanstalt: Leipzig

White F (1987) *The Overview Effect — Space Exploration and Human Evolution*. Houghton Mifflin Harcourt: Boston

Wilson RA and Lucia Foglia L (2016) Embodied Cognition. In Zalta EN (ed.) *The Stanford Encyclopedia of Philosophy*. <http://plato.stanford.edu/archives/sum2016/entries/embodied-cognition/>