

THEOLOGICAL IMPLICATIONS OF POSSIBLE EXTRATERRESTRIAL LIFE

by Sjoerd L. Bonting

Abstract. Bible and tradition remain silent on intelligent extraterrestrial life, and few modern theologians have expressed themselves on this topic. Scientific insight suggests the possibility, even likelihood, of the development of life on extrasolar earthlike planets. It is argued that such life forms would resemble earthly life (biochemistry, genetic system, neuronal processes) and also develop a religious and moral life. As creatures with free will they would be prone to sin and in need of salvation. It is argued that this would not require multiple incarnations, since Jesus is the cosmic Christ.

Keywords: chaos theology; cosmic Christ; extraterrestrial beings; incarnation; multiple incarnations.

Human fascination with the topic of extraterrestrial life is demonstrated by two phenomena. First is the great popularity of science fiction stories about extraterrestrial beings in books, movies, and television programs such as *Star Trek*, which Robert Short (1983) attributes to a search for meaning by the multitudes who have lots of knowledge about everything but little understanding of what it is all about. Second are the thousands of claims of sighting UFOs (unidentified flying objects) and the tenacious belief of so many people in UFOs against all rational explanations (Markowitz 1967).¹ With a mixture of curiosity and fear people wonder whether we are alone in this vast universe. In this article I address the question, If advanced beings do exist elsewhere in the universe, what does this mean for Christian theology?

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FROM SPECULATION TO SEARCH

The Greek philosophers Leucippus, Democritus, and Epicurus (480–270 B.C.E.) already speculated about the existence of life outside the earth (Crowe 1997). The Roman poet Lucretius wrote in *De Rerum Natura* (c. 70 B.C.E.), “So we must realize that there are other worlds in other parts of the universe, with races of different men and different animals. In the totality of creation no thing is unique” (Goldsmith 1980, 4). Plato (c. 310 B.C.E.) and Aristotle (c. 330 B.C.E.), on the other hand, opposed the possibility of extraterrestrial life, which led the early Christian theologians Augustine (c. 400), Albertus Magnus (c. 1250), Thomas Aquinas (1273), and his contemporary Roger Bacon to reject the idea. This changed after Etienne Tempier, bishop of Paris, issued in 1277 a list of condemnations of doctrines that seemed to limit God’s power, one of them being the idea that God could not create many worlds. This led to renewed discussion of the matter in the fourteenth century. After a critical discussion of the arguments of Aristotle and Aquinas, William of Ockham (c. 1320), Jean Buridan (c. 1340), Nicole Oresme (c. 1350) and others judged that a plurality of worlds was not impossible. Later Willem van Vorilong (d. 1463) and Nikolaus of Cusa (1440) published treatises in which they defended the idea of a plurality of worlds.

The advent of the Copernican view of the solar system seemed to make the existence of extraterrestrial life more likely. While Galileo, Descartes, and Kepler retained a cautious attitude, Giordano Bruno heartily embraced the idea in his 1584 treatise *On the Infinite Universe and Worlds* (Goldsmith 1980, 6). Other seventeenth-century pluralists were Tommaso Campanella, John Wilkins, Bernard de Fontenelle (1686), Richard Bentley (1693), and Christiaan Huygens (1698). Voltaire, in the satirical work *Micromégas* (1752), has two giants, one from the star Sirius and the other from the planet Saturn, visit Earth in order to impress upon the reader how small the earth must be in relation to the rest of the cosmos (Goldsmith 1980, 17–19). During the nineteenth century the idea of plural worlds became popular among both atheists such as Thomas Paine and evangelicals such as Thomas Chalmers and Thomas Dick (Crowe 1997). Enthusiastic defenders of extraterrestrial life were the astronomers Richard Proctor (1870) and Camille Flammarion (1862). Their attitude is well summarized by American astronomer and popularizer of science Simon Newcomb, who argued in an article for *Harper’s Magazine* on “Life in the Universe” (1905) that if Earth is a representative planet orbiting a representative star then life must be abundant throughout the universe (Goldsmith 1980, 24–27).

In a recent book entitled *If the Universe is Teeming with Aliens . . . Where is Everybody?* (2002) Stephen Webb considers three possibilities: (1) they don’t exist; (2) they exist but don’t communicate; (3) they are here already.

He believes (1), but does not consider the possibility that as we are still technically incapable of interstellar travel, so they might be. In another recent book Jack Cohen and Ian Stewart (2002) claim that our scientific way to answer the question is wrong. Their approach is, however, more science fiction than science. They claim that our present cosmology is wrong, that there exists a multitude of universes, and that “the [initial] vacuum of space-time might possess sufficient complexity to organize itself into some form of life by carrying out a complete thermodynamic work cycle,” such that aliens might have lived through the inflation (the rapid and large expansion generally assumed to have occurred immediately after the Big Bang). The idea that living beings could exist, let alone survive, in the very early universe is scientifically untenable. Moreover, these authors neglect the fact that the multiverse idea cannot be proven scientifically and that therefore our search for extraterrestrial life must be limited to the only universe we can study on the basis of the laws of physics and chemistry that have been shown to be valid for this universe.

During the twentieth century the advent of modern observational techniques and of space travel has changed the picture considerably. We are now forced to conclude that in our solar system no advanced life exists outside Earth, although microbial life may perhaps have arisen on early Mars, later to be extinguished by climatic change (Bonting 1996, 94–96). So for the existence of advanced extraterrestrial life we must look to planets beyond the solar system. However, evidence for the existence of extrasolar planets has accumulated only in the past forty years, but of the one hundred planets detected so far none seems a likely candidate for the development of life (Lissauer 2002). Visiting an extrasolar planet to look for advanced life is technically impossible: a manned return flight to the nearest star, Alpha Centauri, at 20 percent of the speed of light (about the highest speed achievable with any current spacecraft) would take forty-four years and require for the launch three hundred times the total annual earthly energy production (Oliver 1982).

This means that we have to choose a simpler but indirect approach in the search for extraterrestrial intelligence (SETI). The approach adopted by the SETI Institute (Mountain View, California) is based on the assumption that advanced extraterrestrials, if existing, will have radio and television broadcasts like we do (no irony intended!). Radio and television carrier waves and radiation from large radar installations are known to spread into space to a great depth. There is also the possibility that the extraterrestrials may transmit directed signals. The SETI Institute is presently completing the Phoenix project, a targeted search for microwave signals from one thousand selected sunlike stars within one hundred light years from Earth, which might have an earthlike planet that might have permitted the development of intelligent beings (Wolfe et al. 1982). The

double “might have” indicates how great the uncertainty is, not even counting the problem of synchronicity (or lack of it) of any extraterrestrial civilization with human civilization. Observations are made with a radio telescope, equipped with an ultrasensitive detector with automatic signal processing by a smart software system (Coulter et al. 1994). A frequency range of 1–3 GHz (gigahertz, a billion vibrations per second) is chosen, because in this range there is minimal interference from celestial and terrestrial microwave radiation. In ten years of operation of the project, borrowing time on existing radiotelescopes, more than half of the one thousand targeted stars have now been fully observed, but no significant signals have been detected.² In 60 trillion observations with the 26-m Harvard META telescope only eleven unexplained signals were found; nine of these were not observed again in a supersensitive follow-up, two remain to be repeated. Even if none of these stars would yield a significant signal, we still could not conclude that advanced extraterrestrial life is absent, because there are billions of stars at greater distances than one hundred light years. A novel project, the Allen project, is being developed that will employ a dedicated array of three hundred fifty small (6 m. diam.) radiotelescopes, providing greater sensitivity and 100–1000 times greater speed of search; it is expected to be in operation in 2005. Another approach, an optical search aimed at detecting laser flashes from communication of extraterrestrials with their spacecraft or space colonies, is beginning to be employed.

PAUCITY OF THEOLOGICAL DATA

No references to extraterrestrial life are found in biblical or nonbiblical creation stories (Van Wolde 1996). The two biblical creation stories in the book of Genesis (Genesis 2 from 900 B.C.E.; Genesis 1 from 550 B.C.E.) speak only about creation of living beings on this planet. Nowhere else in the Bible is extraterrestrial life mentioned, if we exclude angels, the incorporeal messengers between heaven and earth. A passage like John 10:16 (“And I have other sheep that do not belong to this fold”)³ is thought to refer to the Gentiles, while 1 Peter 3:18–20 (“in which also he went and made a proclamation to the spirits in prison, who in former times did not obey”) seems to refer to people who died before the time of Jesus, not to extraterrestrials. Tradition (the body of teaching of the early church) is also silent about extraterrestrial life.

This silence is hardly surprising, since (1) the biblical message is “economic” in the sense that it is directed to our life on this planet in preparation for the future life; (2) the geocentric worldview was dominant until the sixteenth century, when it was overturned by the work of the great astronomers Copernicus, Kepler, and Galileo; (3) the scientific insight in the prebiotic formation of life and the possibility of its arising elsewhere in the universe dates from only the last fifty years. As mentioned earlier, in

the pre-Copernican era only Nikolaus of Cusa and his contemporary Willem van Vorilong clearly expressed a belief in advanced extraterrestrials (Crowe 1997; Drees 1987). Even after the overturn of the geocentric model in the sixteenth century the picture does not change much. Bruno (1584) maintained the likelihood of the existence of extraterrestrial beings, “no less nobly” than humans, but made himself guilty of pantheistic immanentism and ended at the stake in 1600. In his *On the Infinite Universe and Worlds* (1584) he presents a fictitious dialogue between Burchio (B) and Fracastorio (F): “B: Then the other worlds are inhabited like our own? F: If not exactly as our own, and if not more nobly, at least no less inhabited and no less nobly” (Goldsmith 1980, 6). Tommaso Campanella, in his *Apologia pro Galileo* (1622), rejected Aquinas’s objection against a multitude of worlds by the argument that it concerns many small systems within one large system. He claims that the inhabitants, not descending from Adam, do not need salvation unless they have committed other sins. De Fontenelle, in his *Conversations on the Plurality of Worlds* (1686), maintains: “The moon, says I, is inhabited, because she is like the earth; and the other planets are inhabited, because they are like the moon” (Goldsmith 1980, 8). Christiaan Huygens (1629–95) left a very speculative work, *Cosmotheoros*, in which he claims the presence of water on Jupiter, Saturn, Venus, and Mercury, and thus of all kinds of plants and animals, and even creatures endowed with reason, created as described for humans in Genesis 1, and having both virtues and vices like us (Goldsmith 1980, 10–16).

Among contemporary theologians there seems to be a lack of interest in the matter of possible extraterrestrial life. This may be due to two factors: the geocentric model has lingered on in our thinking as a result of our human self-centeredness, and the divorce between science and theology since Darwin’s time has placed the question of extraterrestrial life outside the view of most theologians (Drees 1987, 264). These two factors may well explain why such prominent contemporary theologians as Karl Barth, Emil Brunner, Hans Küng, John Macquarrie, Wolfhart Pannenberg, Jürgen Moltmann, Edward Schillebeeckx, and Keith Ward, and even scientist-theologians Arthur Peacocke and John Polkinghorne have not considered the possibility of extraterrestrial life in their theological works. Willem Drees mentions only T. M. Hesburgh, E. L. Mascall, Paul Tillich, H. Berkhof, A. Ford, and S. L. Jaki as contemporary theologians who are willing to accept the possibility of extraterrestrial life (Drees 1987, 264–68). To them may be added Pierre Teilhard de Chardin, who left an unpublished and not very helpful paper on the topic (Bonting 1998, 41–43). Over against them Drees cites several lesser-known theologians—U. Köhler, L. J. Van Holk, J. J. Buskes, E. A. Milne, P. J. Roscam Abbing, and A. J. Burgess—who argue for the physical and/or theological uniqueness of life on Earth (1987, 268–72).

The near absence of sound theological reflection on this topic in Bible and Tradition, and by prominent contemporary theologians, as apparent from the reviews of Crowe (1997) and Drees (1987), necessitates some pioneer work in formulating a theology of extraterrestrial life. In particular, the implications for Christ's redemptive work should be considered. A book edited by Steven J. Dick (2000b) offers little help in this; the chapters by Ernan McMullin (2000) and George V. Coyne (2000) only list the questions to be addressed, and the principles for a "cosmotheology" offered by Dick (2000a, 191–210) hardly represent a Christian theology. Before turning to the theological implications of possible advanced life beyond Earth, I first consider the likelihood of its occurrence and the characteristics such life might acquire.

POSSIBILITY OF EXTRATERRESTRIAL LIFE

The laboratory experiments of Stanley Miller and H. C. Urey gave us some idea how life may have arisen on Earth from inorganic material (Bonting 1996, 82–94; Deamer and Fleischaker 1993). Shortly after its formation Earth must have had an atmosphere, which lacked oxygen and contained nitrogen, carbon dioxide and small amounts of hydrogen, methane, and ammonia originating from volcanic eruptions. These gases can, in the presence of a suitable energy source, form compounds like hydrogen cyanide, formaldehyde, and acetaldehyde, which can serve as intermediates in the formation of aminoacids, the building stones of proteins. The building stones of other essential compounds of a living cell may also have been formed in this way. The absence of oxygen protected these compounds from oxidation. On these grounds a tentative scenario for the origin of the first living cell can be sketched. A possible location for this process is the area around hydrothermal vents in the ocean bottom. The presence of the intermediates mentioned in interstellar space, and of aminoacids of extraterrestrial origin in meteorites, suggests that life can have arisen elsewhere in the universe by a process resembling the prebiotic evolution on Earth.

This would have to be outside our solar system, as it is now generally agreed that Earth is the only planet in our solar system on which advanced life exists. Beyond the solar system there are billions of stars, some of which resemble our Sun in size, age, and luminosity, and these may well have planets. Direct observation of such planets has so far been impossible because of the small angular separation between even a nearby star and its planet and the large luminosity difference between them. Indirect evidence for the presence of a planet can, however, be obtained from the detection of small motions of the star ("wobble") due to the orbiting planet. On the basis of such indirect observations some one hundred extrasolar planets have been discovered in the last forty years, but in view of their large size and elliptic orbits it is very unlikely that advanced life could have arisen on any of these planets (Lissauer 2002).

However, in view of the very large number of stars in the universe, it is likely that there exist some earthlike planets outside our solar system. With more sensitive techniques than currently available, such planets may yet be detected. Any such planet will have to satisfy numerous requirements in order to permit development and maintenance of life on it. A list of thirty-two such requirements has been presented, including that it be a star of between 0.4 and 1.4 solar mass, stable in radiation and temperature for at least the past 4 billion years (the length of time needed for the development of human life on Earth), and a constraint on the distance of the planet to its star of about 5 percent (Moreland 1994, 165–70). The first and last of these requirements may eliminate 99.9 percent of all candidates. With all the additional requirements this may leave a very small percentage of fitting candidates. Yet, in view of the very large number of stars we cannot rule out that there are some.

What can we predict about the nature of the advanced life that could have developed on such a planet?

NATURE OF EXTRATERRESTRIAL LIFE (IF EXISTING)

Everywhere in the universe the same chemical elements are present as on Earth, because hydrogen and helium were formed in the Big Bang, the elements up to iron by nuclear fusion in stars, and the elements heavier than iron probably by neutron capture during supernova explosions. As far as we know, the earthly physical and chemical laws are valid throughout the universe. We can therefore make some predictions about extraterrestrial life. Such life will be based, like all earthly life, on carbon chemistry, since carbon is the only element able to form the long-chain compounds (DNA, RNA, and proteins) that are essential for the complex processes of growth and replication of living cells (Bonting 1996, 100–127).

It is estimated that during 4 billion years of biological evolution on Earth some 2 billion species arose, of which only some 2 million “successful” ones, one in a thousand, have survived. This suggests that in the evolutionary process all possible life forms have been explored. Moreover, all existing species on Earth have basically the same biochemistry, the same DNA-based replication system, and an identical genetic code. Therefore, it seems likely that advanced extraterrestrial creatures (if existing) would not be radically different from *Homo sapiens* in physiology and biochemistry. I would expect these creatures to have brains and neuronal systems resembling ours and thus to have similar thought processes. S. L. Jaki (1980, 124) comes to the same conclusion on theological grounds. I would further expect these creatures to be mortal as we are, since without the life cycle biological evolution cannot take place.

It also seems likely to me that in extraterrestrial evolution of life the same DNA-replication/transcription system would be selected as on Earth.

In the initial stage of the prebiotic evolution DNA replication cannot have been operating, because it needs the presence of enzymes, which are proteins, and their production requires the transcription of DNA via RNA. This chicken-and-egg problem may have been resolved by the discovery in the 1980s that RNA has some enzyme capabilities (Nissen 2000; Kreeger 2002). This has suggested the idea of an initial "RNA world," in which RNA arose, which formed the enzymes needed for the formation of DNA, which then took over transcription and replication. This has then led to the much more versatile and much better protected DNA-replication/transcription system currently operating in all earthly life forms. That of sixteen possible nucleotides only four, labeled A, T, G, and C, occur in all earthly DNA may be due to the fact that these four provide the lowest incidence of replication errors (Bradley 2002).

Another interesting point is the fact that amino acids and many other biomolecules can occur in two mirror-image forms but that living organisms on Earth have only one of these forms, the L-form in the case of amino acids. This form must have been selected early in the prebiotic process, since without this *stereospecificity* of the building blocks there would be no viable replication system, no workable enzymes, no metabolism: life would not exist. Amino acids found in the Murchison meteorite, thought to have come from the asteroid belt between Mars and Jupiter, are predominantly of the L-form. Extensive tests have excluded the possibility of contamination by earthly material, and this suggests that the preference for the L-form already existed in the universe before life on Earth originated (Bada 1997; Horgan 1997).⁴ This means that amino acids of extraterrestrial beings would probably even have the same stereospecificity as those of earthly creatures.

On the basis of our present scientific evidence I consider the development of intelligent life elsewhere in the cosmos, resembling that on Earth, a definite possibility. However, I shall refrain from assessing its probability, because we cannot reliably calculate it. Chaos theory shows that it is difficult, if not impossible, to predict the behavior of complex systems in the course of time (Bonting 2002, 32–36). Moreover, multiplying the probabilities of each separate step in a process like the origin of life may greatly underrate its actual likelihood because of the occurrence of processes of self-organization, for example in membrane formation and the adoption of specific three-dimensional structures by large biomolecules like DNA, RNA, and proteins. We also must bear in mind that the methodology used in the SETI project allows the detection only of advanced extraterrestrials that have developed television or radar one or more centuries ahead of us.

THEOLOGICAL CONSIDERATIONS: BOTTOM-UP

I have presented arguments for assuming that advanced extraterrestrial beings, if existing, would show considerable likeness to us humans, in physiological and even mental processes. Because religious awareness is common to all humans through the ages, we may expect this to occur also in extraterrestrials. This makes it meaningful to trace the development of religious awareness in humans. I call these bottom-up theological considerations, because we look at the process from the creaturely side, from nature to supernature.

The earliest evidence for religious awareness in humans is presented by Neandertal burial places with evidence of ritual, dating from about 100,000 years ago (Bonting 1996, 141). Three stages of religious development are commonly distinguished: animism, polytheism, and monotheism (Long 1995; Park 1989). Primitive, nomadic humans were utterly dependent on nature and saw nature as sacred and every natural object—trees, streams, rocks—as endowed with a spirit. These spirits were thought not only to control the existence of their objects (a tree spirit makes the tree grow and spread its branches; a stream spirit makes the water flow) but indirectly also to influence human life by providing shade, water, and so forth. Rituals were used to ensure the favor of these spirits and to ward off evil. This is animism. Gradually the spirits of animism came to be seen as deities with a personality, whom one had to please with gifts, sacrifices, in order to survive. Deities were then given a name and were usually associated with forces of nature, like storm, rain, and thunder. In addition, tribes commonly adopted a territorial god, like the Baals and Els in Canaan that appear frequently in the Old Testament. In a further development one deity came to be seen as more powerful than the others, as a creator god featured in the creation stories of many peoples (Goldsmith 1980, 8; Bonting 1996, 154–61). This is polytheism.

In the Old Testament we can trace the extended struggle that it took for the people of Israel to advance from polytheism to monotheism (Oesterly and Robinson 1935; Armstrong 1993). It is interesting to note that the polytheistic religions of Egypt, Greece, and Rome did not experience this transition but that it occurred only among the people of tiny Israel. During the Exodus the Israelites had chosen Yahweh, the territorial wilderness god from Mount Horeb, as their guide and protector, but still only a tribal god. After many instances of apostasy (see the books of Judges, Kings, Chronicles) their experience during the Babylonian exile led to the conviction that Yahweh is the universal, omnipresent God, the God of all peoples, Jews and Gentiles (Isaiah 49:6). They see him as the Creator of everything that is, the eternal and only God (Isaiah 43:10; 45:5–7,18), to whom the cosmic forces are small and insignificant (Isaiah 40:12–15, 28). Yet, they also come to experience him as a loving and caring God (Isaiah 40:11),

who seeks to have a personal relationship with his human creatures and who gives them the Law to live by. This posed the question, How can the perfect Yahweh forgive transgressions of his divine Law without compromising his perfect justice? Initially this led to the image of a vengeful god, who ruthlessly punishes the sinner. The prophet Jeremiah sought the solution in replacing the old covenant of Mount Horeb by a new covenant “written upon the heart” (Jeremiah 31:31–34), but he failed to overcome the problem that to the ancient mind a valid covenant requires the blood of a sacrifice. Other prophets predict the coming of a Messiah (Micah 5:2–5; Zechariah 9:9–10), the suffering servant in Second Isaiah (Isaiah 42:1–4, 50:4–9, 52:13–53:12), who will bring reconciliation between Yahweh and his people. Here ends the evolution of religious thinking in the Old Testament period that brought the crucial transition from polytheism to monotheism.

Six centuries later the Jewish followers of Jesus of Nazareth (again a small minority) recognize in this Jesus the promised Messiah, who through his death on the cross brings reconciliation, a new covenant. Through their experience of his resurrection they come to see him as the incarnate Son of God. The pentecostal experience in Jerusalem leads to the awareness of the Holy Spirit as our lasting link with God the Father. The Christian Church is born, grows rapidly, and spreads over the world. Ten centuries of evolving religious experience of Jews and Christians are recorded in the books of the Bible, Old and New Testament. During the first four centuries of our era the experience of the Apostles is formulated by the church in the trinitarian monotheistic doctrine of the one God in three persons, Father-creator, Son-redeemer, Spirit-communicator. To me this is the deepest understanding of God that so far has developed in the human mind, even though the trinitarian nature of God remains a mysterious concept for us.

Along with this evolution of religious thought in humans went the evolution of moral awareness (Bonting 1996, 161–65). The first notion of morality can be seen in *kin concern*, *reciprocity*, and *altruistic behavior* in higher animals (de Waal 2001) and in primitive humans. The first *moral codes* were developed by Egyptians and Babylonians. The precept of “eye for eye, tooth for tooth” in the Babylonian Code of Hammurabi, where it was restricted to the elite, is taken over into Jewish law, where only foreigners are excluded (Exodus 21:23–25). The Jewish code of law is summed up in the Decalogue (Exodus 20:1–17), which is based on the covenant of Israel with Yahweh. Jesus affirmed and at the same time radicalized the Law (Matthew 5:21–48), so that no human can hope to comply with it. From a moral code the Law has thus become a mirror showing us our brokenness, from which we can only be rescued by God’s intervention in the saving death and resurrection of Jesus Christ. Having accepted this message, we may in joy and gratitude for our salvation follow the guidelines of the radicalized Law, knowing that the decisive step has been taken

by God in Christ (Romans 3:20–26; 8:1–17). Morality has thus developed from group morality, without clear transcendent basis, through morality from a divine Law to morality out of gratitude for God's saving act in Christ. Christian morality, rooted in the life, death, and resurrection of Jesus, invites all members of the human family to imitate him in their lives and thus share in his work of salvation. In this way kin concern, reciprocity, and altruism have evolved into a communal ethic with an emphasis on love (*agape*).

From the foregoing considerations it appears that religious experience with an associated moral awareness is a universal phenomenon among humans. It seems to me quite reasonable to assume that a similar religious evolution will take place in the development of any extraterrestrial advanced creatures. However, we must recognize that religious evolution on Earth has led to other faiths beside the Christian faith: continuing Judaism and Islam as closely related monotheistic religions, Hinduism and Buddhism as other forms of religion. Which kind of religion(s) may eventually have developed in any extraterrestrial culture can thus not be answered by bottom-up considerations. So I now move to top-down considerations, based on the Judeo-Christian image of God.

THEOLOGICAL CONSIDERATIONS: TOP-DOWN

Religion can be seen as the result of the interaction between divine revelation and human experience. This means that the development of religious thinking among humans, described in the preceding section, can be considered to reflect the interaction of God's progressive self-revelation with increasing human understanding in human evolution. The experience of the presence of Yahweh with them during the Babylonian exile led the Jewish prophets, particularly Second Isaiah, to the conclusion that Yahweh is not only the God of Israel but the Creator of the entire universe (Genesis 1 was written in the same period). Thus we may say that God is also the creator of any possibly existing extraterrestrials. He is the universal, omnipresent God of all peoples, Jews and Gentiles (Isaiah 49:6), and thus also of any extraterrestrials. In the early church Christ came to be seen as the cosmic Christ (Ephesians 1:20–23; Colossians 1:15–20; Hebrews 2:7–9), as the universal Redeemer ("that the world [Greek *kosmos*] might be saved through him," John 3:17; "in Christ God was reconciling the world [kosmos] to himself," 2 Corinthians 5:19). This means that the creative work of the Father, the saving work of Christ, and the communicative action of the Holy Spirit will apply just as much to creatures on another planet as they do to us. Van Vorilong (c. 1450) already stated that Christ's death on Earth can bring salvation to the inhabitants of other worlds, even if there were an infinite number of these worlds (Drees 1987, 263). Then we may also expect that the one God of the universe will have made himself known to them, as he has progressively revealed himself to us humans.

But then the question arises, Would such extraterrestrial beings also be sinful and in need of salvation? Thomas Campanella (1616) did not think so: "they do not descend from Adam and thus are not tainted by his sin, so they do not need salvation, unless they have committed another sin" (in Drees 1987, 263). This somewhat simplistic reasoning is based on the doctrine of original sin, which is untenable in the light of our scientific insights about the origin of humankind and the weakness of its biblical and theological foundation. Over against this I claim, in agreement with most current theologians, that the story of the Fall in Genesis 3 does not concern a unique historical event but describes in mythical form the condition common to all humans, namely, the human ambivalence of being both image bearers of God and sinners grasping for equality with God. In my opinion it is likely that this would also apply to any extraterrestrial creatures. I have three reasons for this assumption: (1) the expectation that such beings will have a way of thinking similar to that of humans; (2) such creatures also will have received freedom of will as an expression of God's love, giving them the possibility for disobedience; (3) in view of the operation of the remaining element of chaos in the entire universe, these creatures will also be affected by it. The third reason refers to my chaos theology of creation (Bonting 1999; 2002). Briefly put, this poses an initial creation from chaos as in Genesis 1 and 2 (rather than from "nothing"), a continuing creation (cosmic and biological evolution in scientific terms) with a remaining element of chaos, symbolized as *sea* in the Old Testament, which I consider to be the source of physical and moral evil in the world, to be abolished on the last Day ("... and the sea was no more," Revelation 21:1). Thus there seems to be good reason to expect extraterrestrials to be sinners just as much in need of salvation as we are. I would even claim that salvation and reconciliation will come to them at the same time as to us, namely, when Christ at his triumphant return will definitively banish the remaining element of chaos from the universe.

Another question is: Would this require a repetition of Christ's incarnation, death, and resurrection for our extraterrestrial brothers and sisters on their planet? Van Vorilong said that it would not be "fitting" if Christ would have to come to another world to die again (Drees 1987, 262). This is the expression of a sentiment rather than a rational theological statement. E. L. Mascall (1956, 40–45) has discussed the question in a more theological way. He first rejects the "extreme kenotic view," according to which in the incarnation Christ would have scaled down his divinity to the limits of humanhood; in which case the incarnation could hardly have taken place simultaneously on two different planets. He also rejects the idea of a second incarnation after Christ had already been taken up in glory. But, Mascall says, the orthodox view is that the incarnation is not the conversion of Godhead into human flesh but rather the taking up of humanhood into Godhead, so there is no reason why another finite ratio-

nal nature of inhabitants of another planet could not also be taken up in this way, in other words, that several incarnations would be possible. Brian Hebblethwaite (2002) has argued against the possibility of multiple incarnations, but strangely, he believes that this also rules out the existence of advanced extraterrestrial life.

My answer to the question about multiple incarnations follows a different line of thinking but also leads to the uniqueness of Christ's incarnation. Over the centuries popular Christian belief has narrowed down the significance of the incarnation to being merely the prelude to the salvation of us humans. However, I recognize with Paul (2 Corinthians 5:19) in Jesus the *cosmic Christ* (Bonting 2002, 55-61). This fits with our knowledge of cosmic evolution, popularly expressed in the phrase that we are made of "stardust." The hydrogen and helium resulting from the Big Bang produced, through nuclear fusion and supernovae explosions, all chemical elements, which during the explosions were ejected into interstellar space as "cosmic dust." Eventually, local condensation and accretion of the cosmic dust cloud in our galaxy formed the Sun and planets of our solar system. In the prebiotic evolution living cells were formed from these elements, and in the biological evolution all living beings, including ourselves, are formed from these elements through the uptake of food. In this way, we humans have part in, are united with, the entire cosmos, are made of stardust. Jesus, being fully human, also shares in this cosmic union, and thus through the incarnation he becomes the cosmic Christ. The incarnation, death, and resurrection of Jesus Christ, taking place in Palestine two thousand years ago, are of cosmic significance and lasting validity. These epochal events bring salvation to us, who live two thousand years later in other parts of the planet, yes, to all humans who ever lived on Earth at any time and at any place. And not only to humans, but to the whole creation that "has been groaning in labor pains until now and waits with eager longing" for its final liberation, as Paul says (Romans 8:19, 22). Why not then to creatures on another planet?

The universe is a single system, evolving in a process whereby the simple leads to the complex: inorganic matter leads to organic matter, organic matter to living matter, living matter to mind or spirit. The highest principle of unity in our universe is spirit. This insight led William Temple to introduce the concept of the *sacramental universe* (Temple [1934] 1960, 473-95).⁵ In a sacrament the spiritual and the material are intimately related, with spirit being first and last and with matter being the effective expression of spirit. Likewise, in the universe God expresses himself in absolute supremacy and freedom through the evolution of matter to life and of life to human spirit, which is then united through the divine love in the kingdom of God. On the basis of my earlier argumentation that extraterrestrials, if they exist, will strongly resemble us in body and mind, I suggest that they also will participate in the reconciliation brought about

by Christ's incarnation, death, and resurrection two thousand years ago in Palestine, without necessarily requiring a repetition of these events on their planet. And as God has made the message of Christ's saving work heard in all times and in all corners of our planet, so he will also bring it in an appropriate way to any of his creatures on another planet: God's communicative Spirit fills the entire world. They will then also be offered the opportunity to participate in the New Creation that we expect to be part of. If we should never succeed in meeting them in this world, then we shall certainly meet them in the next world—at least if they exist! This will not require any radical change in our theology, merely the willingness on our part to share with them not only the unique place in the cosmos that we had assumed for ourselves but also our salvation. All this I believe to follow logically from our present scientific insights and from a reasonable extrapolation of Christian theology.

And what if none of the search projects detects any signal from an advanced civilization outside our solar system? A negative finding would not be conclusive: we may have to look further into the universe with its billions of stars or find entirely different ways of searching for the existence of extraterrestrials. And what if the findings continue to be negative, and the scientific community comes to the conclusion that we do seem to be alone in this vast universe? Then we must remind ourselves of the fact that even if advanced creatures arose only on Earth, this still required the vast universe of which we are part: gravity would have made a smaller universe collapse far too soon to permit prebiotic and biological evolution to proceed to the point of the arrival of *Homo sapiens*. Then we must praise and thank God for his willingness to create this immense cosmos in order to allow us to arise.

NOTES

1. Sociologist William S. Bainbridge (1998, 671) notes that the New Paradigm in the sociology of religion states that "religion is an inevitable feature of all human societies and that secularization merely weakens old religious movements to the advantage of new ones—rather than marking the triumph of science over religion."
2. Information kindly provided by Dr. Douglas Vakoch, SETI Institute, Mountain View, California.
3. All Bible texts are quoted from the NRSV.
4. The excess of the L-form of various aminoacids in the Murchison meteorite has been attributed to circular-polarized electromagnetic radiation from spinning neutron stars.
5. Paul Tillich also recognized a sacramental aspect of nature (Carse 1996).

REFERENCES

- Armstrong, Karen. 1993. *A History of God: From Abraham to the Present, The 4000 Year Quest for God*. London: Heinemann.
- Bada, Jeffrey L. 1997. "Extraterrestrial Handedness?" *Science* 275:942–43.
- Bainbridge, William S. 1998. "Extraterrestrial Tales." *Science* 279:671.
- Bonting, Sjoerd L. 1996. *Schepping & Evolutie: Poging tot Synthese* [Creation & Evolution: Attempt at Synthesis]. Kampen, the Netherlands: Kok.

- . 1998. "Teilhard de Chardin en Buitenaards Leven" [Teilhard de Chardin and Extraterrestrial Life], *Gamma* 5 (no. 2): 41–43.
- . 1999. "Chaos Theology: A New Approach to the Science-Theology Dialogue." *Zygon: Journal of Religion and Science* 34 (June): 323–32.
- . 2002. *Chaos Theology: A Revised Creation Theology*. Ottawa: Novalis.
- Bradley, David. 2002. "The Genome Chose Its Alphabet with Care." *Science* 297:1789–91.
- Carse, Henry. 1996. "Simple Water, Consuming Flame; Nature, Sacrament and Person in Paul Tillich." *Theology* 99 (no. 787): 22–27.
- Cohen, Jack, and Ian Stewart. 2002. *Evolving the Alien: The Science of Extra-terrestrial Life*. New York: Wiley.
- Coulter, G. R., et al. 1994. "Searching for Intelligent Life in the Universe." In *Advances in Space Biology and Medicine*, vol. 4, ed. S. L. Bonting, 189–224. Greenwich, Ct.: JAI Press.
- Coyne, George V., S.J. 2000. "The Evolution of Intelligent Life on the Earth and Possibly Elsewhere: Reflections from a Religious Tradition." In *Many Worlds, The New Universe, Extraterrestrial Life, and the Theological Implications*, ed. Steven J. Dick, 177–88. Philadelphia: Templeton.
- Crowe, Michael J. 1997. "A History of the Extraterrestrial Life Debate." *Zygon: Journal of Religion and Science* 32 (June), 147–62.
- De Waal, Frans. 2001. *The Ape and the Sushi Master: Cultural Reflections of a Primatologist*. New York: Basic Books.
- Deamer, David W., and Gail Rancey Fleischaker. 1993. *Origins of Life: The Central Concepts*. London: Jones and Bartlett.
- Dick, Steven J. 1996. *The Biological Universe, The Twentieth-Century Extraterrestrial Life Debate and the Limits of Science*. Cambridge: Cambridge Univ. Press.
- . 2000a. "Cosmotheology: Theological Implications of the New Universe." In *Many Worlds, The New Universe, Extraterrestrial Life, and the Theological Implications*, 191–210. Philadelphia: Templeton.
- Dick, Steven J., ed. 2000b. *Many Worlds, The New Universe, Extraterrestrial Life, and the Theological Implications*. Philadelphia: Templeton.
- Drees, Willem B. 1987. "Theologie over Buitenaardse Personen." *Tijdschrift voor Theologie* 27:259–76 (Dutch with English summary).
- Goldsmith, Donald. 1980. *The Quest for Extraterrestrial Life*. Mill Valley, Calif.: University Science Books.
- Hebblerhwaite, Brian. 2002. "The Impossibility of Multiple Incarnations." *Theology* 104 (no. 821): 323–34.
- Holden, Constance. 2002. "E.T., Where Are You?" *Science* 296 (19 April): 465.
- Horgan, John. 1997. "The Sinister Cosmos." *Scientific American* 276 (no. 5): 16–18.
- Jaki, S. L. 1980. *Cosmos and Creator*. Edinburgh: Regnery Gateway.
- Kreeger, Karen Young. 2002. "Atomic Resolution of Large Ribosomal Subunit Reveals Structure." *The Scientist* 16 (no. 24): 38–39.
- Lissauer, Jack J. 2002. "Extrasolar Planets." *Nature* 419:355–58.
- Long, Charles H. 1995. "Primitive Religion." *Academic American Encyclopedia*, electronic version. Danbury, Ct.: Grolier Inc.
- Markowitz, William. 1967. "The Physics and Metaphysics of Unidentified Flying Objects." *Science* 157:1274–80.
- Mascall, E. L. 1956. *Christian Theology and Natural Science*. London: Longmans Green.
- McMullin, Ernan. 2000. "Life and Intelligence Far from Earth: Formulating Theological Issues." In *Many Worlds, The New Universe, Extraterrestrial Life, and the Theological Implications*, ed. Steven J. Dick, 151–75. Philadelphia: Templeton.
- Moreland, J. P., ed. 1994. *The Creation Hypothesis, Scientific Evidence for an Intelligent Designer*. Downers Grove, Ill.: InterVarsity.
- Nissen, P., et al. 2000. "The Structural Basis of Ribosome Activity in Peptide Bond Synthesis." *Science* 289:920–30.
- Oesterly, W. O. E., and Th. H. Robinson. 1935. *Hebrew Religion: Its Origin and Development*. London: SPCK.
- Oliver, Bernard M. 1982. "Search Strategies." In *Life in the Universe*, ed. John Billingham, 351–76. Cambridge: MIT Press.

- Park, George K., ed. 1989. "Systems of Religious and Spiritual Belief." *Encyclopaedia Britannica* 26:569–616.
- Short, Robert. 1983. *The Gospel from Outer Space*. London: Fount.
- Temple, William. [1934] 1960. *Nature, Man and God*. London: MacMillan.
- Van Wolde, Ellen. 1996. *Stories of the Beginning*. London: SCM Press.
- Webb, Stephen. 2002. *If the Universe Is Teeming with Aliens . . . Where is Everybody?* New York: Springer.
- Wolfe, John H., et al. 1982. "SETI, the Search for Extraterrestrial Intelligence: Plans and Rationale." In *Life in the Universe*, ed. John Billingham, 391–417. Cambridge: MIT Press.