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Connections between Catholicism and Science: Astrobiology Edition

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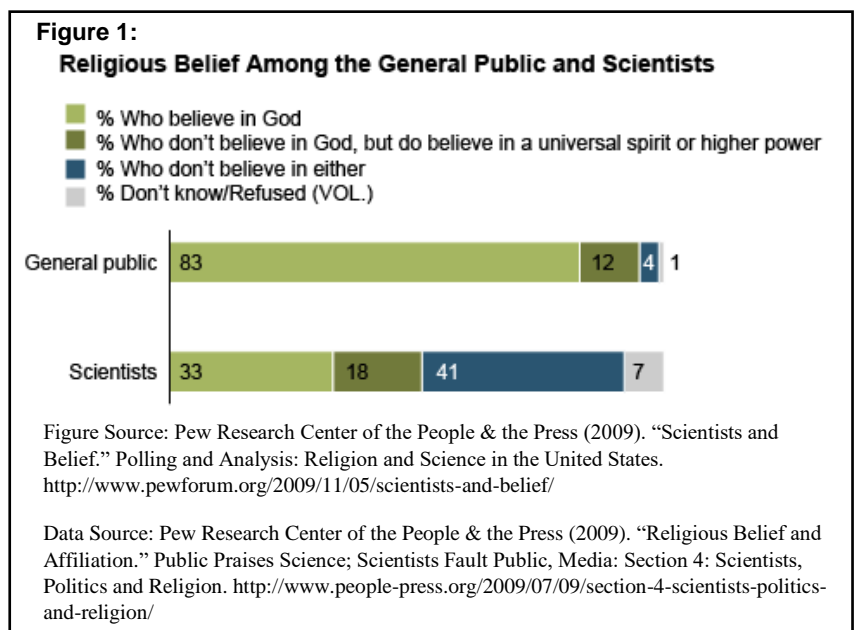
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Connections between Catholicism and Science: Astrobiology Edition

In the past 50 years, an immense amount of research has been done in order to scientifically investigate how the universe was created, how Earth was created, what life is, and what is truly necessary for life to exist. Astrobiology has become the newly coined term to encompass this scientific field and research pertaining to these questions. Discoveries and implications of astrobiology have the possibility of connecting with many other branches of academia and of touching almost every aspect of human life. This makes it a particularly important field to consider.

Religion is one of those aspects to which the human experience that the astrobiology field can extend by exploring questions like “How did life appear in our universe?” “Was it ‘created?’” “How did life develop?” “Is it possible that life elsewhere could have also been ‘created?’” Of the 7.6 billion people on Earth, an overwhelming majority of humans claim to adhere to some type of religion. Despite this overwhelming majority, one study done by the American Association of the Advancement of Science in 2009 found that the scientific community is not as believing. While 83% of the general public believe in God, only 33%

expressed belief in God (See Figure 1 and Appendices for additional statistics). Why is this? Are scientists just too preoccupied with their science to ponder matters of faith? Is there something about their chosen field that holds scientists back from believing? Is there something



contradictory between believing in God and science? By focusing on the religion of Catholicism in light of astrobiology's discoveries regarding creation of the universe, creation of life, and even creation of intelligent life, I hope to show that religious beliefs and science do not have to contradict one another, and they may even fill in gaps each seems to have when standing alone. I also hope to explore the implications that possible future astrobiological discoveries may have on Catholicism.

I. The Story of Creation

1. Creation according to Science

First, we must hear what science seems to say about creation, specifically creation of the universe. The Big Bang is a widely accepted scientific theory stating that the universe originated from a miniscule “ball” of electrons, protons, and photons that expanded, cooled, and eventually joined to form our universe and all of the galaxies, planets, stars, etc. within it. This idea was initially formed by Georges Lemaitre and was confirmed when Edward Hubble discovered that the universe's planets and galaxies are constantly moving away from one another. From this discovery, the assumption that there was an ultimate consolidation at some point prior to this expansion logically followed. Scientists have concluded that the expansion and cooling process took under three minutes, after which the joining of protons and neutrons began. The universe continued to expand as a hot cloud of gas for hundreds of thousands of years. After a lengthy time of expansion, galaxies formed and stars formed from gas clouds collapsing within those galaxies. The Big Bang is hypothesized to have occurred 13.8 billion years ago, but our particular galaxy is aged at 13.2 billion years old, and our sun is much younger at about 4.6 billion years old. According to the nebular hypothesis, Earth, like the other planets in our solar

system, were created from a cloud whose matter was drawn inward on itself eventually fusing molecules like hydrogen and helium together and forming the Sun at the hot center. The materials in the once disk-like cloud not consumed by this collapse correspond with the planets of the solar system. But that is not all if we are to consider the maturation of these planets to what we “know” of them today. 4-3.8 billion years ago, the Late Heavy Bombardment took place; the alignment of Jupiter and Saturn’s orbits caused a shift in the planetary orbits of Neptune and Uranus that eventually sent small icy bodies and asteroids hurtling into the inner solar system towards planet like our Earth. These bombardments would eventually create the planet in its current form and some scientists propose that the collisions with certain bodies like asteroids are responsible for the delivery of organic chemicals and water supply to Earth (NOVA; Catling, 14-30).

Further along it will also become essential that we know exactly what scientific thought exists regarding the creation of life, so let us briefly address a few theories on the origin of life on Earth, namely *panspermia* and *prebiotic chemistry*. The first suggests that life arrived from meteorites or space dust, and thus puts the origin of life beyond our humble abode. However, the second describes a process of chemical evolution in which simple molecules on our Earth gave rise to more complex molecules to eventually make life, and it has become an intriguing theory explored by many scientists ever since Charles Darwin briefly wrote about the concept in his letters to other scientists in 1871. In addition, to the uncertainty of the theory of prebiotic chemistry, there is much debate as to the sources of organic carbon thought to be needed in order for life to form, and the way in which this organic material was incorporated into what we call a genome isn’t quite agreed upon. However, despite all of the uncertainty, through analysis of

samples taken from various parts of the world, show that life was certainly found on Earth by 3.5 billion years ago (NASA; NOVA; Catling, 31-43).

2. *Adding Catholicism to the Creation Conversation*

In the Book of Genesis, a sequence of creation taking place over seven days is described: first the universe, day and night, followed by the sky, earth and sea, sun and moon, creatures of the sky and sea, creatures of the earth, and lastly, human beings. There is no description of billions and billions of years passing, just a mere seven days. There is no detailed scientific account of how exactly these things were created, simply that God commanded, “it was done,” and all was created “good” by God (*The Bible*, Catholic Online, Gen 1.1-31).

In order to understand why these stories of creation seem so different from one another, the purpose of each story must first be acknowledged. Although there are some Christian fundamentalists religions who believe in the literal interpretation of the Bible, many experts of Scripture and Catholicism have shown that Genesis was not actually made to be a science book describing the exact, historical creation of the universe. This can be first be seen when God sees everything he made as “good” and beautiful immediately following his creating it. Science has no bearing on goodness or beauty. It simply describes observations of the specific way things occur. Genesis is a statement of the goodness of creation and the goodness of the Creator. It is a comment more about the Creator and who He is more than anything else (Coyne). The Catholic Church specifically says, “...these studies (theology) is strongly stimulated by a question of another order, which goes beyond the proper domain of the natural sciences. It is not only a question of knowing when and how the universe arose physically, or when man appeared, but rather of discovering the meaning of such an origin: is the universe governed by chance, blind

fate, anonymous necessity, or by a transcendent, intelligent and good Being called "God"?... (Catholic Church 2:284). In addition, Genesis was written to withstand time for all believers. Science books often become out of date and need to be updated. However, Genesis' message about God and his act of creation out of love needs no further updating since it makes no scientific claims (EWTN. *World Over* - 2014-09-18 – *Baptizing E.T.? Vatican astronomer Br Guy Consolmagno with Raymond Arroyo*). Just as philosophical writing on a topic of say friendship for example differs from the information written in psychology textbooks on friendship or from a fictional story written about friends, the scientific account of creation differs from the Biblical account because they have different purposes. They have different meanings to convey.

Interestingly, once the true meaning of each is acknowledge, it can be shown that the claims being made do not actually contradict one another. It is quite possible that God created the universe out of love, seeing everything he created as good and beautiful as Catholicism suggests, while implementing the details science points to. God could have created that “miniscule ball of electrons, protons, and photons that eventually expanded and cooled to form our universe and all of the galaxies, planets, stars, etc. within it.” Because the seven days of creation were not meant to be taken as a literal representation of history rather a form of organized telling of a meaningful story, it is still possible that the scientific timeline of creation stands alongside Genesis' seven day story. Both offer different but not necessarily contradicting truths about the same reality of creation.

3. The Connection between the Two and its Relevance

All of this is well and good, but why should we care about this intersection of theology and science when it comes to creation and creation of life? The simple answer is that neither can fully explain what life is, and both bring something unique to the complex question. Science seeks to find what distinguishes life from non-life and what material pre-cursors must be present for life to take place. Countless definitions have been proposed, but none seem to be all-encompassing enough. Some describe life in a sense of boundaries: life vs. non-life. Others use a central principle that is most essential or most interesting when it comes to life, and yet others operationally define life as if it is something that can be tested for (The University of Arizona. *What is Life?*). Theology and philosophy, on the other hand, seek answers describing the meaning of life. Why was life created? What is the purpose or ultimate end of life? Could life have some immaterial aspect to it? An immaterial end? What does it mean to be fully alive? By bridging these two aspects of life, science and religion enhance how we can comprehend life in its entirety. Science allows us to see how things are manifested in our world while theology provokes thoughts on why things are manifested in that way.

Sometimes questions in science even indirectly search for this bridge between the two. The Star of Bethlehem is a great example. In an interview on EWTN, the President of the Vatican Observatory Foundation and the Director of the Vatican Observatory, Br. Guy Consolmagno was asked which star in particular could possibly be the Star of Bethlehem that is so essential to Christianity and its story about the coming of Jesus Christ. His quick response was “Which one? There are so many!” After this cheeky response, he continued to address the even deeper question of why this question seems important to people. The underlying question is really, “How does God act in the World?” (EWTN. *World Over - 2014-09-18 – Baptizing E.T.?*

Vatican astronomer Br Guy Consolmagno with Raymond Arroyo). We need to be cautious to assume that God can be completely comprehended through science, but many scientific questions are indirect ways of analyzing characteristics of God, how He ordered the world, and how He continually acts in his creation. How did God create? What did God create? Could he have created intelligent life like humans elsewhere? How does he continue to have a hand in creation? These are all questions that address the intersection of religion with the natural sciences, and that is why the Catholic Church is extremely open to scientific exploration on these topics in particular. As Br. Consolmagno puts it, the Church pursues science because it is “interested in creation as an expression of the Creator” (EWTN. *World Over - 2014-09-18 – Baptizing E.T.? Vatican astronomer Br Guy Consolmagno with Raymond Arroyo*). The Vatican even has a Pontifical Academy of Sciences that hosts various conferences for presentation of current scientific explorations. One conference that was held within the last few years was an Astrobiology Seminar to address the specific questions mentioned previously on life in the universe. Among the topics and sessions offered were The Origin of Life, Habitability through Time, Environment and Genomes, Detecting Life Elsewhere, and Extrasolar Planets (Lunine and Funes; Funes and Lunine).

Now that we have explored both the scientific claims on creation and the Catholic claims on creation, how they seem to stand side-by side and fill one another’s gaps, and the fact that the Church is a large supporter of scientific exploration, let us turn to a specific field of research within astrobiology that poses interesting questions for Catholicism, namely life and intelligent life elsewhere in our universe.

II. The Search for Intelligent Life

1. Science and Intelligent Life Elsewhere

The presence of intelligent life and the religious implications of finding intelligent life elsewhere is one of the aspects of astrobiology that is particularly controversial as astrobiology research progresses. The current hypothesis that technological civilizations exist currently drive the search for extraterrestrial intelligence – SETI - and their *technosignatures*. From this assumption, the Drake Equation was developed by Dr. Frank Drake to calculate how many transmitting, intelligent civilizations could theoretically be in our galaxy. Below is a copy of this equation:

$$N \text{ civilizations} = R \times f_{\text{planet}} \times n_{\text{habitable}} \times f_{\text{life}} \times f_{\text{intelligence}} \times f_{\text{civilizations}} \times l$$

R = birth rate of stars

f_{planet} = the fraction of those stars having planets

$n_{\text{habitable}}$ = average number of planets per planetary system that are habitable

f_{life} = fraction of those planets on which life originated and evolved

$f_{\text{intelligence}}$ = fraction of inhabited worlds that developed intelligent life

$f_{\text{civilizations}}$ = fraction of those worlds that developed civilizations capable of interstellar communication

l = lifetime of those communicating civilizations

As SETI Institute points out, there is no certain solution to the equation, but it is widely used by scientists to stimulate curiosity at the least and to propose, using science of course, how many civilizations exist in our universe (SETI Institute: “The Drake Equation”). In his book, David C. Catling uses current scientific evidence for each of the unknown variables and calculates an answer of 4, four communicating civilizations in the Milky Way right now! Now, pretty much any number could be plugged into this equation to produce an answer from 0 to infinity, but the more important thing to recognize here are the different components that go into producing a civilization: presence of a star that has planets which are habitable and have communicating, civilizations of intelligent life (Catling, 120-121). If this equation rightly combines all of the necessities for survival of intelligent life elsewhere and is even remotely close to being a correct

number of communicating civilizations, our first reaction is “Woah!” However, our next reaction is “Why have we not heard from them...ever?” This is the *Fermi Paradox*: aliens exist and are capable of communicating with us but they have not. Catling suggests that there really is only three solutions to why we have not heard from these civilizations if they do exist: we are actually alone (no paradox exists), the intelligent species really isn’t trying to colonize the galaxy, or they are just hiding from us (Catling, 123-124). However, many scientists have responded to the Fermi Paradox with a few more possible technical and sociological arguments (SETI Institute: “The Fermi Paradox”). In addition, in light of the recent exposé on possible UFO sightings by a special program in the Pentagon, is it possible that extraterrestrial intelligent beings have tried to communicate with us but we are simply unaware or unable to receive or even recognize it? Since it is beyond the focus of this paper to look more into these possible solutions of the *Fermi paradox* and in an effort to refocus on the connections between astrobiology and theology, in the case that these predictions are correct and there actually is communicating, intelligent life elsewhere, where does that leave Catholicism?

2. Catholicism and the Possibility of Extraterrestrial Intelligence

2.1 The Unique Quality of Humanity

For Catholicism, a characteristic specific to humanity when comparing it to other species is its uniqueness. Genesis describes how God created humans “in his image and likeness” giving them rational intellect and free will. In order to fully unpack this, the first thing we must do is define intelligence. Intelligence is a higher, spiritual cognitive power whose functions are attention, conception, judgement, reasoning, reflection, and self-consciousness. Modern-day psychology may argue that intelligence can be simplified to sense cognitions, but that is not what

we mean here. The difference becomes apparent when we evaluate animal “intelligence” and human intelligence. An animal such as a dolphin or chimpanzee have been said to be very intelligent but they do not have abstract thought. They do not imagine the future. They do not try out new ideas or ponder why they exist. They may know that something is right or wrong by association or conditioning with negative or positive reinforcement but they will not reflect on why something is right or wrong, if a hypothetical situation would be right or wrong. This rationality regardless of association/conditioning is something that distinguishes human intelligence, and this is the gift God gave man by making him “in his image and likeness” as seen in Genesis (Michael Maher, 1910).

Despite the fact that it is more logical for a more animal-like extraterrestrial to be found than a complex, human-like extraterrestrial, the remainder of this paper will focus on human-like extraterrestrials for exactly the reason spoken of above, rational intelligence and free will. If an alien lacks these things, than he will have no comment on the uniqueness of humanity acknowledged in Catholicism just as a dog, a cat, a fish, or any other animal has no bearing on the unique qualities of humanity explained above. However, if he is human-like in that he has rational intelligence which will allows self-knowledge and free will to autonomously rather than instinctually carry-out actions he may enter into our conversation.

Moving forward, then, would the discovery of another intelligent species similar to humanity in intelligence and free will destroy humanity’s uniqueness or destroy its purpose? Catholicism already holds the belief that there are intelligent beings similar in intelligence to humans: angels. The Catechism of the Catholic Church describes angels as “spirits” who are “messengers of God,” meaning they do not have bodies as humans do. “As purely spiritual creatures, angels have intelligence and will: they are personal and immortal creatures, surpassing

in perfection all visible creatures, as the splendour of their glory bears witness” (Catholic Church 2:330). However, this does not destroy the uniqueness of humanity, who was created body and soul, material and immaterial, in the “image and likeness of God” himself. It also follows that whether another intelligent species is found or not found on Earth, the presence of human life can still be significant and special. Life in itself is an awesome concept that even today we struggle to fully comprehend. It may disrupt our narcissistic, self-centered ego, but the singularity of intelligent life in humans or the multitude of intelligent life in species others than humans is still a manifestation of the awesomeness of what it is to be alive (Coyne).

Another thing to consider when it comes to humanity’s uniqueness in the face of other intelligent life is that the Church states “Love does not cut things off from the universe rather it causes more love for the universe. Love includes.” Along these lines, another intelligent species would not necessarily be a threat of destruction to humanity. As previously discussed, God created the universe out of love. Is it possible, then, that God’s love manifested through our creation and through the creation of this other hypothetical intelligent species would connect us more to the universe? In addition to our joint creation out of love, the new technologies presented through the intelligent species and their unique perspective and experience of the Creator may allow us to encounter God in a new way. Likewise, we may do that for them making it a mutual closeness to God that is achieved (Coyne).

2.2 Free Will, Salvation, and the Incarnation of Jesus Christ

Another thing that must be considered is whether this other intelligent species will have certain things like free will as humans do. In the case that God did create this alien species with a corporeal body – bound by time and space similar to humans and unlike angels – and with free

will, our next question would be regarding a “Fall.” Through the free choice of Adam and Eve, all of humanity is now subject to “original sin,” and the majority of Catholicism revolves around the salvation of humanity from this sin. However, it is quite possible that another intelligent species made a different decision, specifically to live in union with God. This very idea of whether an alien species would choose to fall as humans did is explored in the fictional books of C.S. Lewis’s *Space Trilogy*.

Beyond this point though, there are multiple different hypotheticals that is up for discussion but there is one thing for certain based on Church teaching; Br. Consolmagno explains, “If you were to encounter a race that has never sinned, how would you know that they had the freedom that is essential for the ability to be truly good? But once you do allow for mistakes, you also need a way to remedy those mistakes” (Consolmagno). Catholicism holds that God is good, all loving, and all merciful among many things. Because of his love for humanity, he freely chose to save all humans so that they may eventually be united with him, and there is no reason that this should be any different for another intelligent species that experienced a similar Fall (Coyne).

The way in which God would carry out this act of salvation for hypothetical aliens is still under much debate by theologians. For humans, the Incarnation of the Son of God, the Second Person of the Holy Trinity, in the person of Jesus Christ is a central part of salvation. The Catechism states that God became man for four specific reasons: “in order to save us by reconciling us with God,” “so that thus we might know God's love,” “to be our model of holiness,” and “to make us ‘partakers of the divine nature’” (Catholic Church 457-460). By the Passion, Death, and Resurrection of Jesus Christ cleansed humanity from sin, restored their

relationship with God that they once rejected, and allowed them to join him in Heaven as was the purpose of their creation (Catholic Church 1988).

Is it imperative, then, that this information on salvation depicted in the Bible extend to any aliens found in our universe in need of salvation? Thomas O'Meara, O.P., a professor of theology at Notre Dame would argue yes, but only to a degree.

“...the history of sin and salvation recorded in the two testaments of the Bible is not a history of the universe; it is a particular religious history on one planet. Earlier centuries saw wider intimations of Christianity, because the universe as they knew it centered on earth. Christians believed that Jesus was the Word of God come to this earth as a man. But the central importance of Jesus for us does not necessarily imply anything about other races on other planets. Jesus' teaching and life brings eschatology but not astronomy. However, the divine generosity that led once to the Incarnation on earth suggests that there might be other incarnations— many incarnations and in various species, many creatures touched in one or another special, metaphysical way by a person of the Trinity” (O'Meara, 28).

What he is eluding to here is another mode of incarnation, another incarnation of Jesus Christ in an alien race. Put simply, it is essential to the salvation of humans that Jesus Christ became human (I encourage more research on this topic since it is outside the scope of the paper to completely explain and comprehend why this statement is made by the Church). O'Meara's logic is that in the case that there exists an alien race that needs to be saved, it would be essential for the Incarnation granting salvation to take place by “a Jesus” of their own race rather than the human race, for Jesus Christ to assume their specific race. Before I deviate to my own hesitations

on this topic, I first have to acknowledge that he is not the first to have this idea. Abbe Nicholas Malebranche and Abbe Jean Terrasson – well-known thinkers of the 17th and 18th century – are among the few that have considered this topic and the even fewer that agree with O’Meara.

I begin to see a disconnect, whether apparent or true, when contemplating this concept of multiple modes of Incarnation and the Holy Trinity (there is not much debate on this, so I must revert to my own opinion). The Incarnation states that God became a man, body AND soul, in the person of Jesus Christ. To separate the person of Jesus Christ from his human body in order to put his soul in another body, may cause some problems. To which body does he truly belong? Is it possible to say that he still became man if he was created body, soul, and another body...and another body...and so on? O’Meara speaks to the fact that Thomas Aquinas in particular also had these thoughts. However, unlike myself who is not completely convinced most likely due to the fact that I am still lacking in complete comprehension of his logic, Thomas Aquinas states that it is possible!

“The power of a divine person is infinite and cannot be limited to anything created...If a divine person could not assume another [created nature], then the personal mode of the divine nature would be enclosed by one human nature. But it is impossible for the Uncreated to be circumscribed by the created. Whether we look at the divine power itself or its personhood (the term of the union [with Jesus]), one must say that the divine person can assume more than one human being" (O’Meara, 13).

In brief, he is suggesting that since the divine is outside of creation and cannot be bound by creation, the inability to assume many different created races would not be an inability of the

trine and all-powerful God. From this, the possibility of multiple incarnations is clear, and the disconnect suggested previously may only seem to be a disconnect at first glance.

As one of my colleagues brilliantly brought to my attention, I think it is also worth contemplating what this means for Mary the Mother of Jesus Christ. Will there also be multiple Mothers of God if Jesus is incarnated in an alien race? Unfortunately, there is not much written on this topic, but I think it may be very interesting if the Church or experts on Catholicism would look into this questions regarding astrobiology and the possibility of multiple Incarnations in light of the Trinity and the Mother of God.

2.4 The Sacraments, particularly Baptism

Another topic to discuss when moving beyond the salvation of extraterrestrials is the sacraments. By definition, “The sacraments are efficacious signs of grace, instituted by Christ and entrusted to the Church, by which divine life is dispensed to us. The visible rites by which the sacraments are celebrated signify and make present the graces proper to each sacrament. They bear fruit in those who receive them with the required dispositions” (Catholic Church 1131). Naturally, we associate the sacraments with humans because Jesus Christ was incarnated as a human being and instituted the sacraments for humans. With this knowledge in mind, could sacraments be extended to another intellectual species residing elsewhere?

This particular question relating to the sacrament of Baptism was posed to Br. Consolmagno by a journalist recently. “Would you baptize an extraterrestrial?” His quick, witty response was, “Only if they ask!” (EWTN. *World Over - 2014-09-18 – Baptizing E.T.? Vatican astronomer Br Guy Consolmagno with Raymond Arroyo.*). As Br. Consolmagno later suggests, this question has many deeper implications than what is directly asked. Rather than really

exploring the scientific possibility of extraterrestrials being discovered, the question really seeks to further understand Baptism and humanity's experience of Baptism. As a side note, I would further that argument by saying that asking the same question about any of the sacraments is truly more of an inquiry about the sacrament than the intellectual species. One of the first aspects to consider is whether baptism is *necessary* for an extraterrestrial. The Catechism states that, "By Baptism all sins are forgiven, original sin and all personal sins, as well as all punishment for sin. In those who have been reborn nothing remains that would impede their entry into the Kingdom of God, neither Adam's sin, nor personal sin, nor the consequences of sin, the gravest of which is separation from God" (Catholic Church 1263). In order for baptism to fulfill its purpose, there must be some sin weighing on the hearts of the extraterrestrial that is separating them from union with God. Furthermore, this sin which Baptism would save the extraterrestrial from would imply that the species had/has free will to choose this union or disunion at some point because God, in his infinite goodness, would not create an innately sinful race. He would, however, create a species having free will - he did so with us. In addition, the fact that an extraterrestrial would ask to be baptized shows some understanding of remedying his sinful shortcomings on the other species' part. By his answer of only if they ask, Brother Consolmagno acknowledges that in order for baptism of an extraterrestrial to take place, they must have free will to ask for the sacrament, there must be some sin to be saved from, and there must be some understanding of their own sin and a need to be freed from that sin (Consolmagno).

Once again we are forced to contemplate the incarnation of Jesus Christ and whether he is the savior for all races, human or alien. Jesus Christ instituted the sacraments for humanity, but is it possible to extend that to all intelligent life? If the multiple incarnation theory turns out to be

plausible and true, wouldn't their incarnation of the Savior have established sacraments for their race comparable to our own?

III. Conclusions to be made

After analyzing aspects of crossover between science and religion through the lenses of astrobiology and Catholicism, hopefully, I have shown that the two do not have to stand in opposition to one another. First, we explored creation as explained by astrobiology and as explained by Catholicism to find that they not only can stand side by side but also fill in the gaps the other cannot fill, such as how historically things were created and why things were created in such a way. Next, we were able to explore the scientific search for extraterrestrial life stemming from the field of astrobiology and the implications that discoveries may have on Catholic teaching in areas including human uniqueness, the incarnation, and the sacraments. From what we have discussed in light of the little outside discussion that has been done on these possibilities, we found that it is still possible for astrobiology and Catholicism to agree even if intelligent extraterrestrial life is found elsewhere. In order to show this relationship even further, I would encourage theologians and scientists alike to further dive into this conversation on what a discovery of intelligent life elsewhere could mean for both fields. As a Catholic that acknowledges how the church is in favor of ethical scientific research as a way to discover more about The Creator, His creation, and His constant hand in the continuing of creation, I would argue that no matter what is discovered by true science will be welcomed by the Church and further enlightened through the insight the Church can offer beyond the natural sciences.

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Appendix

