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Insignificance and cosmic solitude: Evolution of two ideas in science fiction

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Abstract: Insignificance and cosmic solitude are found with great frequency in science fiction, philosophy, art, scientific dissemination and in the collective imagination. The origin of cosmic insignificance dates back to the dawn of modernity, with the emergence of scientific rationality and heliocentrism. Cosmic solitude is typical of the 20th century and it emerges in the context of the search for extraterrestrial intelligence and the terrible possibility that humanity is on the brink of self-destruction. This article will analyze the origin, development and some variations of these two important ideas.

Keywords: heliocentrism, SETI, popular science, Carl Sagan, Arthur C. Clarke, cosmic insignificance, cosmic solitude

A very small stage in a vast cosmic arena

One of the most famous texts about cosmic insignificance is inspired by a photograph not taken by a human being. In 1990, and from beyond the orbit of Neptune, the space probe *Voyager 1* took an image in which the Earth appears as a small particle. It was dubbed "A Pale Blue Dot." Later, Carl Sagan wrote a homonymous book in which he explains that this small and insignificant dot encloses absolutely everything that humanity is and has been, all its creations, its miseries and its glories. For Sagan, cosmic insignificance is an irrefutable fact and is as evident as this photograph. Nevertheless, the insignificance does not discredit our achievements but rather it should make us aware of our ethical and ecological duties: "To me, it underscores our responsibility to deal more kindly with one another, and to preserve and cherish the pale blue dot, the only home we've ever known." (Sagan, 1997, p. 7). For Sagan, cosmic insignificance does not imply any existential anguish. The problems of human beings are minuscule and from a calm contemplation of this condition, one can begin to construct a future where we overcome our differences.

On the one hand, we can define cosmic insignificance as a feeling of irrelevance in the face of the infinity of the universe. On the other hand, cosmic solitude is understood as the trepidation that emerges from the possibility that humanity is the only intelligent civilization. Today, both motifs are used profusely in philosophy, science fiction, art, scientific dissemination, and in the collective imagination. Insignificance and cosmic solitude are such everyday subjects that almost every contemporary piece about the search for life or extraterrestrial intelligence begins with the question "Are we alone in the universe?". It's hard to notice that these ideas have not always been around; on the contrary, they have a precise beginning and a development. Unlike the loneliness that we all can experience throughout the course of our lives, insignificance and cosmic solitude are not typical of every era. On the contrary, they are constructions that have been possible thanks to scientific and technological developments (such as the heliocentric model, radio telescopes and the modern search for extraterrestrial intelligence) and complex cultural processes (involving philosophy, popular science, and literature). The purpose of this article is to construct a brief history of how these two ideas have emerged and how they have developed in science fiction and in a wide variety of discourses. First, we will analyze cosmic insignificance, since it is the oldest and also lays the foundations to be able to understand the other topic. Later, we will analyze how, due to the great interest that arose around Mars in the 19th century, the idea of cosmic solitude began to take shape. Finally, the contributions that various authors made to this topic will be analyzed, from those such as Russell and Huidobro who see loneliness as a result of scientific discoveries, to Clarke and Sagan who see the search for extraterrestrial intelligence as a way to overcome loneliness.

The age of insignificance

Pre-Socratic philosophers had a wide variety of conc-

eptions about the Earth and the universe that may seem exotic nowadays. For example, according to Thales of Milet, who inherited the vision of the Egyptians, our planet floats on water (Pecker, 2001, p. 43); for Anaximander, the Earth is a cylinder (Pecker, 2001, p. 46); and for Petro, there are 183 worlds organized in the form of an equilateral triangle (Pecker, 2001, p. 47). Later, Plato and Aristotle would formulate the arguments that would allow all this multitude of ideas to be left aside and the geocentric model would be implemented. It is worth mentioning that there were other visions about the universe, but the most widespread, commented on and accepted during Antiquity and the Middle Ages was, without a doubt, geocentrism.

Geocentrism is not only a scientific model, but also a philosophical one. Of course, its success has to do with its ability to explain certain natural phenomena, but also it has to do with all the philosophical and mythical ideas that it entails. In their writings, Plato and Aristotle created a universe that is ruled by divinity, harmony and perfection, and where humankind is the focal point. In this respect, Pecker writes: "The Greeks regarded the Earth as a sacred object and geocentrism was a way for Greek culture to assert its theologically driven conception of the Earth" (Pecker, 2001, p. 88).

In *Timaeus*, Plato compares the universe to a living being, characterized as perfect, unique and incorruptible. This idea would have a great influence on the thoughts of the Middle Ages. In the same vein, Aristotle wrote about the unmoved mover, the divine force located in the final sphere of the sky that moves all other celestial bodies; this idea would be redrawn by the Christian religion and scholastic philosophy. For St. Thomas Aquinas, the Christian god is in the highest sphere and it is because of him that the other spheres get their strength to revolve.

The best example of the importance of the geocentric model to the medieval religious vision is *Divine Comedy* by Dante. In accordance with Dante, there are nine spheres of heaven while underground the Earth there are just as many corresponding to hell. The circles are not merely a physical explanation of the universe, but rather they are mixed with an eschatological idea of existence. The universe is designed to allow travel and give meaning to life through sin and redemption.

The arrival of heliocentrism in the 16th and 17th centuries would lead to a series of profound transformations that would forever change the way the universe was conceived. Heliocentrism would open the floodgates to the influx of scientific and philosophical questions that would be incompatible with religiosity of the time. The discovery that the planets' orbits are not circular but rather elliptical would call into question the idea of celestial perfection. In addition, the universe now seemed to extend infinitely, instead of being reduced to nine spheres. Meanwhile, the Earth would be dethroned from its central position and would become one of the planets that revolve around the sun. Finally, the possibility opens up that there could be other "men" or intelligent beings on other planets.

Martin Luther's reaction towards Nicolaus Copernicus is an example of the attitude that Christianity had against heliocentrism: "This fool [Copernicus] wishes to reverse the entire science of astronomy; but sacred Scripture tells us that Joshua commanded the sun to stand still, and not the Earth." (as cited by Russell, 1935, p. 23). The Spanish Inquisition, Lutherans and Calvinists, classified heliocentrism as an absurdity and heresy (Rossen, 1995, pp. 161 and 217). It was practically impossible for Christian doctrine to adapt to the new conception of the universe:

> The doctrines of the Incarnation and the Atonement could not appear probable if Man were not the most important of created beings. Now there is nothing in the Copernican astronomy to prove that we are less important than we naturally suppose ourselves to be, but the dethronement of our planet from its central position suggests to the imagination a similar dethronement of its inhabitants (Russell, 1935, pp. 23-24).

Even though the discoveries of Copernicus, Kepler and Galileo were severely attacked by Christianity, there was no turning back. At the same time the Earth ceased to be the center of the universe, many philosophical, religious or mythological ideas that were related would also enter into crisis. In this context, the

cosmic insignificance became one of the central ideas of scientists, writers and philosophers. It is not that this idea did not exist in Antiquity, but that with the new and vast universe of heliocentrism, cosmic insignificance became the inescapable way of understanding the relationship between the human being and the cosmos. We can identify three ways in which cosmic insignificance has been addressed: 1) A terrifying experience that causes a feeling of devastation because the human being seems null and meaningless; 2) Something incredible that arouses curiosity and sense of wonder; 3) A frame of reference that allows us to put in perspective the importance of human affairs in a different way. Below are some examples of these three ways of looking at cosmic insignificance.

A terrifying experience

As soon as scientific rationalism emerged, thinkers saw this new paradigm as something terrifying that threatened religion and the unity of the ancient cosmos. The crisis of the mythical-religious discourse linked to geocentrism would first be perceived by those who were knowledgeable about scientific matters. One of those individuals was John Donne, a poet that was also an avid reader of astronomical discoveries of his time: "it is agreed that he read Kepler's book about a nova in 1606 and Galileo's about his discoveries through the telescope in 1610, as soon as they came out" (Empson, 1995, p. 84). In his poem "An Anatomy of the World" (1611), the author leaves evidence of grief due to the rupture of the former paradigm of the universe:

> And new philosophy calls all in doubt,
>
> The element of fire is quite put out,
>
> The sun is lost, and th'earth, and no man's wit
>
> Can well direct him where to look for it.
>
> And freely men confess that this world's spent,
>
> When in the planets and the firmament
>
> They seek so many new; they see that this
>
> Is crumbled out again to his atomies
>
> (Donne, 1990, p. 212).

Donne sings in a tone of elegy to all these notions of the cosmos that, since the new astronomical discoveries, now seemed invalid. The human soul, represented in this poem by the fire element, is threatened by the vision of new scientific rationalism. Donne regrets that the union that existed between humankind and the cosmos is being replaced by the fragmented world of the cold and incomprehensible atoms.

Like Donne, Blaise Pascal is an example of a man who suffers from the mythological and religious crisis that produced heliocentrism. He was a notable mathematician and an inventor who made numerous contributions in various fields of knowledge, among which are "calculating machines, the very first public transportation system, probability theory, decision theory, and much of the mathematics of risk management." (Connor, 2009, p. 20). One night in 1654, Pascal had a mystic vision that changed him forever. After this moment, he converted to Jansenism and drew up a plan to write his "Apology for the Christian Religion." He never finished this work, but fragments of it would be edited and published after his death under the title of *Thoughts* (1670). In it, Pascal describes humans as beings without direction, lost in the universe:

> When I consider the short duration of my life, swallowed up in the eternity before and after, the little space which I fill and even can see, engulfed in the infinite immensity of spaces of which I am ignorant and which know me not, I am frightened and am astonished (Pascal, 2014, n. 50).

The paradigm of heliocentrism created a universe infinitely larger than that of the nine spheres. This is what Pascal captured in his vision: cosmic insignificance is terrifying and human beings, incapable of creating a moral or a true knowledge of reality, must resort to god. Without divine comfort, they will fall into existential nausea. Despite having been a genial scientist, Pascal's thoughts are dominated by theological sentiment and they are the result of a man overwhelmed by the new scientific paradigm.

Amazement and wonder

The astronomer Christiaan Huygens explains in The

Cosmotheoros (1698) that he will write about "the Extent of that Universe of which our Earth is but an inconsiderable point." (Huygens, 1722, p. 4). Unlike what happens with Pascal, the cosmic insignificance does not terrify Huygens, perhaps due to his firm conviction that scientific knowledge does not contradict the sacred writings. Another famous astronomer, John Herschel wrote in a tone similar to that of Huygens. In the introduction to his book, *A Treatise on Astronomy* (1833), he writes:

> After dilating his thoughts to comprehend the grandeur of those ideas his calculations have called up, and exhausting his imagination and the powers of his language to devise simile and metaphors illustrative of the immensity of the scale on which his universe is constructed, he shrinks back to his native sphere; he finds it, in comparison, a mere point (Herschel, 1951, p. 2)

The previous paragraph is one of the most beautiful examples of the feeling of wonder caused by cosmic insignificance. Herschel describes how his scientific intellect and his imagination take delight in thinking about the immensities of the cosmos. This description can be equated with a mystical experience of communion with infinity. Although a great effort is necessary, scientific imagination is capable of freeing human beings from their earthly bonds and showing them the secrets of the universe.

Put in perspective the importance of human affairs

In his wonderful novella *Micromegas* (1752), Voltaire resorts to cosmic insignificance to put the human passions in perspective. In this text, two giants, one from the star Sirius and another from the planet Saturn, visit the Earth. The whole story emphasizes, in a comical tone, that human beings are insignificant. For example, the inhabitant of Sirius, Micromegas, explains that he has visited places where there are beings who could crush the planet Earth with their footsteps, and he is surprised that beings so close to nothing (human beings) are capable of reasoning. The giants take a boat, which in their eyes seems very small, and begin to talk with their crew. They assume that by possessing so little matter, humans live without worry and in a state of perpetual happiness. But the humans reveal that, in reality, they are full of perversions, madness, vices, and wars, before which the aliens are horrified. Then, when visitors ask what the soul is, one of the theologians answers that the truth is in St. Augustine's *Summa Theologica,* and that the whole universe was created for humans, and then: "At this monstrous assertion, our two travelers could not help in rolling upon one another in endeavoring to stifle that inextinguishable laughter [...] and in the midst of all these convulsion, the ship which the Sirian held on his nail, fell into the Saturnian's breeches-pocket." (Voltaire, 1807, p. 145). Laughter and the comic denouement highlight the smallness of human beings. The story is a satire against violence and religious arrogance.

Friedrich Nietzsche is another thinker who uses the motif of cosmic insignificance in order to put something in perspective. As is well known, this philosopher tackles the problem with language, that which will lay the foundations of the linguistic turn of the 20th century. His first observations on the matter are found in the course notes of his philosophy and rhetoric classes, but he develops these intuitions in a much more systematic way in "On Truth and Lies in a Nonmoral Sense" (1873). The first paragraph of this essay reads:

> In some remote corner of the universe that is poured out in countless flickering solar systems, there once was a star on which clever animals invented knowledge. That was the most arrogant and the most untruthful moment in "world history"—yet indeed only a moment. After nature had taken a few breaths, the star froze over and the clever animals had to die (Nietzsche, 1989, p. 246).

Nietzsche begins his essay with this small and devastating tale of science fiction. This genre that was just emerging was not unknown to the philosopher. In his notebooks, Nietzsche reveals his fascination for science fiction: he thinks that writing scientific-roman is one of the highest purposes, that the will to power will lead us to Mars and equates this genre with tragedy (Roberts, 2009). In all his philosophy projects, he criticizes the ideas that occidental culture has considered as universal and transcendent since Plato, such

as morals and metaphysics. The use of the motif of cosmic insignificance can be understood as a way in which the philosopher puts into perspective another one of those transcendental ideas: the truth. In this essay, he argues that what we call truth is nothing but a convention that everyone finds comforting and that rests on a web of metaphors and rhetorical games.

I have shown here three different ways of seeing cosmic insignificance, but you should not think that these are mutually exclusive. In Sagan's text, the astonishment before the universe and the desire to put into perspective the problems of humanity are equally evident. And in Pascal, it is present in the sense of wonder, even though it beats against the terror of infinity.

The dawn of cosmic solitude

The feeling of solitude can be driven by many factors. Take, for example, the case of the monster that asks Dr. Frankenstein to create him a partner because he feels isolated. This being's loneliness is provoked by the cruel society that alienates and rejects him. On the other hand, cosmic solitude has to do with a sensation of insignificance and that humanity is the only one of its kind to exist in the universe. Social and personal rejection do not play a role here. Insignificance and cosmic solitude are very similar and many times they appear together as if they were two aspects of the same misery of existence. However, while insignificance came about not long after the first publications on heliocentrism, cosmic solitude was, in turn, relevant until the end of the 19th century.

One of the factors that drove cosmic solitude has to do with the interest in the existence of extraterrestrial life. Pondering about the existence of "men" in other worlds is not something recent. Various texts about inhabitants of the Moon can be found since ancient times, such as *Mahabharata*, *The Wonders Beyond Thule*, *Gargantua and Pantagruel*, etcetera. The tradition of imagining life (mainly on the Moon) continued after the arrival of the heliocentric paradigm with texts such as *Somnium* (1634) by Kepler; *The Discovery of a World in the Moone* (1638), by John Wilkins; and *The Man in the Moone* (1638), by Francis Godwin. However, it was not until the end of the 19th century that concern over the existence of an extraterrestrial civilization came to the fore. What triggered this fever were the observations of Giovanni Schiaparelli. During the Mars opposition of 1877, this important astronomer, director of the Brera Observatory in Milan, saw *canali* on the red planet. *Canali* in Italian means *channels*, but it was mistranslated into *canals*, a word that implies that they were built by intelligent beings (Sagan, 2013).

A few years later, Percival Lowell published *Mars* (1895), a book where he claims that those canals were built by intelligent beings. The subject attracted enormous attention from the public because, unlike previous texts, now extraterrestrial life seemed to be supported by scientific evidence; that is, the canals observed by Schiaparelli and Lowell themselves. Although today it is known that Schiaparelli's and Lowell's assumptions are completely false, in their time, they had a huge impact. Newspapers would be fundamental to propagating the idea that there were beings on the red planet in the mind of the public. The article "A signal from Mars" (1896), from *The San Francisco call*, says that M. Javelie discovered luminous projections that were interpreted as: "inhabitants of Mars were flashing messages to the conjectures inhabitants of the sister planet Earth." (A signal, 1896, p. 16). In "Hello, Earth, Hello" (1920), an article published by *The Tomahawk*, the opinions of several scientists and inventors from the era regarding the possibility of signals from other planets are presented. The article creates a very broad panorama on everything that was believed about extraterrestrial civilizations: how to communicate with them (wireless telegraphs, balloon-suspended radio antennas, light beams); the possible planets on which they live—Mars or Venus; and even their physical appearance and supposed superhuman intelligence. The article included the notable opinions of Lowell, Edison, Tesla, Marconi, and Einstein (Hello, Earth, 1920, p. 6).

Lowell's books have a seductive and poetic prose that captivated the public. Take for example the introduction of his book *Mars* (1895), where he uses a bunch of metaphors and motifs. One of them is, of course, cosmic insignificance: "Indeed, we seldom stop in our

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locally engrossing pursuits to realize how small the part we play in the universal drama." (Lowell, 1896, p. 4). This author also denies cosmic solitude: "there is no indication that we are sole denizens of all we survey, and every inference that we are not" (p. 3); and later: "we cannot seriously take ourselves to be the only minds in it all." (p. 5). In Lowell, cosmic loneliness does not appear with the same force as in later texts, that feeling of rootlessness and infinite orphanhood is not yet present. However, his speculations and his writings laid the foundations for this topic to be taken up again in the following decades.

The contributions of Bertrand Russell, Joseph Conrad, and Vicente Huidobro were fundamental in the development of the topic of cosmic solitude, since it could be said that they are the first to give it great emotional and philosophical depth. Russell was one of the most remarkable philosophers and logicians of the 20th century, as well as a pacifist, atheist, and promoter of nuclear disarmament. In his essay, "A Free man's Worship" (1903), he captured the anguish that was felt after the unity and perfection between humans, divinity, and the universe was put into crisis. The essay begins with a conversation between Mephistopheles and Faust, in which the former claims that god created humanity because, jaded by the choirs of angels, he wanted humans to praise him despite treating them with cruelty. Thus, humans were created for the lack and perpetual scarcity, as a result of the whim of a ruthless being that rejoices in its misfortune. Immediately after the dialogue, Russell adds: "Such, in outline, but even more purposeless, more void of meaning is the world which Science presents for our belief" (Russell, 1961, p. 67). Russell resorts to the legend of Faust, a wiseman who sells his soul to the devil, as a metaphor for what humanity has done: sacrificed their souls in exchange for scientific knowledge. The essay focuses on how to confront this new world devoid of divine meaning which has been created by discoveries in physics and biology. Both sciences created a deep crisis of faith; the first with heliocentrism and the second with the theory of evolution, and Russell devotes a chapter to each of these crises in his book *Religion and Science* (1935). Later, he writes:

> In the spectacle of Death, in the endurance of intolerable pain, and in the irrevocableness of a vanished past, there is a sacredness, an overpowering awe, a feeling of the vastness, the depth, the inexhaustible mystery of existence, in which, as by some strange marriage of pain, the sufferer is bound to the world by bonds of sorrow. [...] from the great night without, a chill blast breaks in upon our refuge; all the loneliness of humanity amid hostile forces is concentrated upon the individual soul, which must struggle alone, with what of courage it can command, against the whole weight of a universe that cares nothing for its hopes and fears (Russell, 1961, p. 71).

Russell describes a cruel universe in which human beings must confront solitude. In his tone, one can sense the hybris of the epic heroes that valiantly fight against the inexorable forces of fate. Loneliness was part of Russell's general conception of existence. He mentions it frequently in his letters (Russell, 2002, n. 13, 17, 21, 29, 236) and in the "Introduction" of his famous book *History of Western Philosophy* (1945), he writes that "cosmic loneliness" is the condition in which humanity finds itself and against which philosophy must be made (Russell, 1946, p. 11).

Joseph Conrad writes about cosmic loneliness in a similar tone to Russell, as if it were a struggle, something terrifying and disastrous against which human beings must constantly fight:

> One of those dewy, clear, starry nights, oppressing our spirit, crushing our pride, by the brilliant evidence of the awful loneliness, of the hopeless obscure insignificance of our globe lost in the splendid revelation of a glittering, soulless universe. I hate such skies (Conrad, 2011, p. 52).

Conrad's character feels tormented by a night of furious clarity. The spectacle of the stars did not incite the plenitude of communion with nature, unlike what Walt Whitman feels in the poem "When I Heard the Learned Astronomer." (Whitman, 1995, 250). Whitman prefers the mystical experience of looking at night over astronomical knowledge. Rather, Conrad feels a sense of misery while remembering the loneliness

and insignificance of his life and of all of humanity. It fits to mention that Russell was a close friend of Conrad and that he admired this deep understanding of solitude that was transmitted through his novels. According to Moran (1982), it is this shared vision of the world and this feeling of loneliness that made them so close while being so different (p. 40). Solitude is a constant in Conrad's work. This along with other subjects, such as the tragedy of existence, the debility of human nature, and the loyalty of lost causes, make up contemporary sensibility (Meyers, 1990, p. 186).

The Chilean poet Vicente Huidobro records in *Altazor* (1931) the feeling of solitude that the cosmos provokes:

> Why did you suddenly one day feel the terror of being?
>
> And that voice that shouted you're alive and you don't see yourself living
>
> Who made your thoughts converge at the crossroads of all the winds of pain?
>
> The diamond of your dreams shattered in a sea of stupor
>
> You're lost Altazor
>
> Alone in the middle of the universe
>
> Alone like a note flowering in the heights of space
>
> There's no good no evil no truth no order no beauty
>
> (Huidobro, 2015, p. 17).

In "Canto I," the speaker advances through a meaningless universe. Just like in Donne and Russell, the crisis that Huidobro confronts relates to the achievements of science. It is the scientific paradigm that has removed beauty from the universe and which has caused existential anguish. A few verses later, the Chilean poet adds: "I feel a telescope pointed at me like a revolver" (p. 17). The telescope, a symbol for astronomical research, is a threat to Huidobro. It is the great eye that, in its eagerness for knowledge, has deprived human beings of meaning. Vicente Huidobro was interested in astronomy and he liked to attend nocturnal gatherings with this purpose. Born in the second half of the 19th century, Conrad, Russell, and Huidobro bore witness to the enormous scientific advances of the time and both felt alone before the new universe that science was revealing. In these three writers, cosmic solitude can be seen as a terrible feeling that humanity has to deal with.

But soon, cosmic solitude went to science fiction. This literary genre has a natural concern for the impact of scientific and technological developments, so it seems to be the ideal niche for the theme of cosmic solitude to evolve. In Olaf Stapledon's novel, *Star Maker* (1937), the protagonist is in a moment of deep depression in the face of the imminence of war. Then, seeing a star makes him think that there is something that unites the human with the cosmos and other beings, and that gives meaning to the desire for community: "With painful clearness I realized that the purpose of my pilgrimage was not merely scientific observation, but also the need to effect some kind of mental and spiritual traffic with other worlds, for mutual enrichment and community" (Stapledon, 2004, p. 30). In those lines, Stapledon moves away from the vision of aliens that other science fiction writers have. For example, in *The War of The Worlds* (1898), H. G. Wells describes the Martians as belligerent and destructive beings. On the other hand, according to Rutledge (1982), Stapledon's novels: "represent a complex intellectual quest after an adequate philosophical grounding for the concept of community." (p. 274). Before Stapledon, literary writers like Russell and Huidobro had related cosmic insignificance and solitude with scientific progress, as if the science was guilty of its existential crisis. On the other hand, Stapledon introduces an important innovation: the protagonist feels overwhelmed for several personal problems and specially for his violent context. Thus, the origin of cosmic solitude is not the scientific knowledge but the imminence of war.

In his texts, Clarke frequently speaks of solitude (Clareson, 1976) and, in addition, unravels the relationship between this and contact with extraterrestrial life. This is one of the central themes that comes up in many of his fictional texts, such as "The Sentinel" (1951) and *2001: A Space Odyssey* (1968). He also sheds

light on this subject in his essays, which can be classified somewhere between scientific dissemination and speculation, such as in the case of *Report on Planet Three* (1972) where he writes: "Even if our cosmic conversation never rises above the 'Me Tarzan-You Jane' level, we would no longer feel so alone in an apparently hostile universe" (Clarke, 2011).

In "The Sentinel," a story that contains the basic elements that will later be part of *2001: A Space Odyssey*, an explorer sees a reflection of light in the Moon. Impelled by curiosity, he enters one of the mountain formations that surround *Mare Crisium*, where he finds a pyramid protected by a kind of force field. The protagonist explains that such a strange entity must be the creation of a very old alien race that wandered through space leaving those pyramids, those sentinels, on every planet where they thought that life could emerge. The pyramid was purposely placed on the Moon, in a way such as a test, because to get to it, you had to have high-tech abilities. What this ancient race was looking for was not just life, but rather another advanced civilization with whom a conversation could be established: "Theirs would have been a loneliness we cannot imagine, the loneliness of gods looking out across the infinity and finding none to share their thoughts." (Clarke, 1976, p. 164). Clarke was the first to clearly suggest this idea that it is only with the encounter with another extraterrestrial civilization that we complete ourselves and that we can suppress the radical vacuum of our own existence.

Traditionally, one of the solutions to solitude has been to look for the company of the friends, the couple, etc. The novelty is that Clarke's characters seek the relief of loneliness in the company of a neighbor who is not human. In Clarke, it can be seen as the influence of Stapledon, a writer he admired. Loneliness is not personal, but that of the entire human race, incapable of recognizing itself if it is not in the mirror of an alien civilization.

In the book *Intelligent Life in the Universe* (1966), a text that Sagan wrote in collaboration with Iosif Shklovskii, he says:

> Are there other intelligences in the universe? Is the Galaxy filled with civilized worlds, diverse and unimaginable, each flourishing with its own commerce and culture, beffiting its separate circumstances? Or can it be that we are alone in the universe, that by some poignant and unfathomable joke, ours is the only civilization extant? (Sagan & Shklovskii, 1966, p. 357).

This is the first popular science text where the search for extraterrestrial intelligence is clearly related to cosmic solitude, a union following Clarke's footsteps. It is a crucial moment because Sagan laid down the groundwork for how to understand and justify to the public the scientific search for extraterrestrial intelligence. From this moment forward, cosmic solitude became commonplace in nearly every popular science text regarding this subject. Examples of this seem to be endless: from the question "Are we alone?" on the "About us" page of SETI Institute, to the title of the book *Five Billion Years of Solitude: The Search for Life Among the Stars* (2013), by Lee Billings. Popular science's predilection for the motif of cosmic solitude is due to the fact that it is much more appealing than other approaches to win the sympathy of the public and the financing of governments. In other words, who would want to fund an investigation whose objective is to contact a civilization that could destroy us?

The friendship between Sagan and Clarke generated a fruitful exchange of ideas. Sagan proudly claims that his scientific speculations inspired the author; that he helped him to "resolve a critical plot issue in movie *2001*"; and that he sent him photos of the *Viking* and *Voyager* probes (Sagan, 1981, p. 2). We can imagine this leading scientist sending photos of planets that humanity has seen for millennia merely as bright points in the sky to a leading writer. And now, they have been shown in detail, displaying their clouds and their bands, something that no other generation has seen before. Here we have the writer inspired by the astronomer. But the opposite also deems true. Sagan (1981) writes: "What Arthur has done for me is vastly greater" (p. 2). In this essay, Sagan refers specifically to Clarke's great influence in preparing the presence of humanity beyond Earth. Even though he does not explicitly state it, it is also clear that Sagan has been inspired by Clarke's

way of seeing cosmic solitude and how the sensation is alleviated by the encounter with an extraterrestrial civilization. Carl Sagan left a legacy of works that have become part of current consciousness. His speech, "Pale Blue Dot," or his question "Are we alone in the universe?" excellently fulfilled their mission to spread scientific knowledge, but they went much deeper. Carl Sagan is not just a scientist or a disseminator of science, but a poet, whose metaphors manage to inspire and captivate readers.

In accordance with Dick, three events mark, in the 1960s, the beginnings of the modern era of the search for extraterrestrial intelligence:

> (1) the publication of the landmark article by Giuseppe Cocconi and Philip Morrison, "Searching for interstellar communications," in *Nature* in 1959, suggesting that a search be carried out at the 21-cm radio wavelength, (2) Frank Drake's Project Ozma in 1960, which carried out the first such search at Green Bank, West Virginia, and (3) a small but now legendary conference at Green Bank in 1961, where the feasibility of a search was discussed (Dick, 2006, p. 3).

One of the most important contributions of the Green Bank conference was the Drake equation (Drake, 2014), which tries to answer how many intelligent civilizations exist in our galaxy. This equation is composed of astronomical, biological and cultural variables. These include the number of stars in the Milky Way, how many of them have inhabitable planets, the fraction of those planets that can foster life or civilizations and the average lifetime of a civilization. The issue lies in the fact that it's practically impossible to know the exact value of some of the variables in Drake's equation. Nonetheless, some calculations suggest that the number of advanced civilizations in our galaxy are in the tens of millions (Sagan, 2013, p. 319).

It seems to be that the universe is full of intelligent life, however it still has not been detected. Is it possible that we are alone in infinity? The fact that we still have not established contact with extraterrestrial life is referred to as Fermi Paradox. The phenomenon got its name from a conversation that took place in 1950 about flying saucers when Fermi exclaimed, "Where is everybody?" (Davies, 2011, p. 168). Multiple explanations have been developed (Webb, 2002) for the contradiction between the universe, supposedly so chock-full of life, and the sterile silence that surrounds us, from those that have a scientific sustenance, like the one that argue that the closest civilizations are several hundred light years away, to those that are rooted in science fiction, like the hypothesis of the dark forest, which Cixin Liu delves into in his homonymous novel.

One of the explanations for the Fermi paradox is that of the great filter. It states that, by developing advanced technology, most civilizations destroy themselves. Thus, although life has arisen in many places, very few societies manage to survive long enough to come into contact with others. The great filter explanation materialized from the observation of what happens in our own planet: contamination, the mass extinction of species, the destruction of ecosystems, armed conflicts and the constant threat of nuclear war. The 20th and 21st century are marked by a constant shadow of guilt, rage and fear. There is a sense of hopelessness in seeing that humanity has driven itself to the brink of self-destruction. Along with the search for extraterrestrial intelligence, the feeling of despair is what gives so much strength to the cosmic solitude in the second half of the 20th century.

In the chapter "Encyclopaedia Galactica," in his book *Cosmos* (1980), Sagan conducts a science fiction exercise on the theme of the great filter. He describes a hypothetical encyclopedia where the descriptions of civilizations that have reached maturity are placed (Sagan, 2013, p. 33-35). This closely resembles the story "Silly Asses," by Asimov. In Asimov's text, Naron records humanity in a book, along with the civilizations that have reached maturity, but almost immediately erases it because he realizes that they use nuclear energy for war purposes. Asimov makes a sharp criticism where he points out that, despite humanity's great technological advances, it suffers from a moral blindness that has produced a huge trail of destruction and death. In *Cosmos*, Sagan also criticizes the devastation that human beings have caused. If

other civilizations are the same, that would be a sad explanation of our loneliness: "Perhaps civilizations arise repeatedly, inexorably, on innumerable planets in the Milky Way, but are generally unstable; so all but a tiny fraction are unable to survive their technology and succumb to greed and ignorance, pollution and nuclear war." (Sagan, 2013, p. 315).

In one of the most recent texts on cosmic solitude, its link to destruction is also evident. In the science fiction tale "The Great Silence" (2016), by Ted Chiang, the narrator is a parrot that lives near Arecibo, one of the most potent radio telescopes on Earth. He reflects upon why humans are so obsessed with the search for extraterrestrial intelligence. He argues that the parrots are exactly what we are looking for: a non-human species capable of communicating with us. In this story, as in the other works of Ted Chiang, language is one of the central themes. Thanks to language, it is possible to communicate and thus, exist. Language and communication are what oppose death. The narrator seems to know those texts by Clarke and Sagan by heart where cosmic solitude is alleviated through an encounter with the other. Unfortunately, meeting with humans has been devastating because we have remained deaf to the voices of the other beings. Humans have not only been incapable of recognizing the intelligence of parrots, but we have driven them to the brink of extinction. This story is not a criticism against SETI, but rather against the insensitivity of human beings in recognizing the richness of their environment. It is also a call to halt the mass extinction of species. The feeling of solitude does not arise from wellbeing or from deep happiness, but rather from deprivation and pain. That is why cosmic solitude became a subject with such resonance from the second half of the 20th century. In the texts of Stapledon, Clarke, Sagan, and Chiang, the sense that our civilization is about to be filtered, and on the verge of destruction is the soul of cosmic solitude.

The only home we've ever known

Cosmic solitude and insignificance emerge from new discoveries, but they have also inspired scientific development. It is impossible to ignore the fact that cosmic solitude, as developed by Clarke, and the modern era of SETI had an almost parallel evolution. It would be naive to think that researchers are in an ivory tower, perpetually locked in the search for objective knowledge. Many scientists continue to declare that their curiosity and creativity have been sparked by science fiction. A detailed studio of how cosmic solitude has influenced these researchers would exceed the objectives of this paper. However, it seems pertinent to note that there are many examples of scientific projects that were inspired by cosmic loneliness: the Ozma project; the plaques onboard the *Pioneer 10* and *Pioneer 11* probes; the Voyager Golden Record; the message sent in 1974 to the Great Cluster in Hercules; or, more recently, the *Perseverance*'s calibration plaque with the inscription "Are we alone?" (Chang, 2021). Using the terminology of Holton, solitude and cosmic insignificance are *themata*, meaning, beliefs that play a fundamental role in the inspiration and creative process of scientists (Holton, 1988, p. 10).

The scientific search for extraterrestrial intelligence has profoundly influenced the way that people in contemporary society view themselves. Paradoxically, in the geocentric model, the feeling of cosmic solitude was unthinkable. Although humanity was the only one, there was no place for solitude because the system was already complete and perfect, coddled by divine care. On the other hand, heliocentrism opened the possibility that in the vastness of the infinite cosmos, there could be other civilizations. Or not. Although some calculations about Drake's equation seem to show that the universe is full of life, the truth is that we are still alone.

In the poem "Nineteen Hundred and Nineteen," by Yeats, the swan is the symbol of solitude by excellence. This apocalyptic text reads as follows:

Some moralist or mythological poet

Compares the solitary soul to a swan;

I am satisfied with that,

Satisfied if a troubled mirror show it,

Before that brief gleam of its life be gone,

Insignificance and cosmic solitude, continued

An image of its state;

The wings half spread for flight,

The breast thrust out in pride

Whether to play, or to ride

Those winds that clamour of approaching night.

(Yeats, 1996, p. 208)

The swan, or the parrot by Ted Chiang, is an animal that sings when it knows that death is close. It does not bend in its meeting with fate, but with bravery and beauty, it confronts death with his wings wide open. In the same way, cosmic solitude emerges from a sense that disaster is imminent, and that humanity is about to be devoured by the night that it has created itself. But there is hope. Just as the swan, fatality can and should be assumed. The swan is a model for that soul that is ready to fly, the one that will bravely face the tragedy. Cosmic solitude has prompted us to search for kindred connections in the stars. Perhaps it inspires us also to create solutions for the devastation that looms over us.

Insignificance and cosmic solitude, continued

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