

Article

“Touch” the Sun and “Touch” the Cosmic Space to Learn How to Touch the Earth: Space Sustainability as an Ethical Guide for Relations: Mystery and Humility

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Abstract: On 14 December 2021, the extraordinary event called “touching the Sun” has been heralded as a “monumental moment for solar science”, in which the Parker Solar Probe opened up a new frontier of research for Space exploration, proposing the challenge of reaching, studying, and even “touching” our Sun at close range. The consequences of this event are scientific but also metaphysical and transcendental, offering the opportunity to reflect on the complex reality and meaning of the “boundaries” as opportunities for relationships and then for ethics. In this paper, I would like to propose an attempt to develop a possible discussion for an extension of Space Sustainability as an ethical guide for humanity which, as it goes out into outer Space, is helped to rediscover new, expanded dimensions of perception along the path of mystery and humility, in order to return back to Earth enriched for new relationships in pursuit of the common good.

Keywords: touching the sun; boundary; integral sustainability; space sustainability; ethical dimension; common good; extended perceptual dimensionality; humility; mystery; theology



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1. Introduction

With the launch of the Parker Solar Probe Mission on 12 August 2018, a new frontier of research has opened up for Space explorations, which proposes the challenge of reaching, studying, and even “touching” our Sun up close. The distance, of course, but also the very high temperatures of this “small” star which is truly “daily” for us, represent a real boost, on the one hand for the development of innovative technologies, and, on the other hand, for the collection of absolutely unique and precious experimental data. This important scientific result, in addition to being a milestone in the development of technology and empirical knowledge, raises several foods for thought about the meaning of Space explorations and the horizon they open up. The Universe is a boundless horizon in a physical sense, but it could also represent a horizon of a metaphysical nature, highlighted precisely by this experience of touching an essentially intangible “surface”.

In the first part of this article, I will take a cue from this scientific “touch” and its physical–empirical peculiarities as a starting point and analyze them carefully in order to then proceed to considerations relating to the new extended perceptual experiences characteristic of Space exploration—that is, on how the concept of “touching” the Cosmic Space could be understood. This extension combines in itself the technological dimension (providing direct and indirect measurements) and the metaphysical dimension (relating to the meaning to be given to the concept of “reaching” the Cosmic Space), which by its very nature highlights the complex issue of the “boundaries”. The result is the opening and development of some important reflections related to what can be called “Metaphysical Space Resources”. The terms ‘touching’ and ‘boundary’, which will be used throughout this article, both refer to the surface of the Sun and to the Cosmic Space, and take their cue from the ‘technical’ usage contained in the specific Space mission; however, in this article, they will be filled with further and deeper metaphysical and ethical meanings.

In the second part, I will try to develop a track that could offer us opportunities to deepen the concept of Space Sustainability. The latter could include the calling, on the one hand, to a redefinition of the complex reality and meaning of the “boundary” in the sense of the mystery, and therefore of an originality “for” a relational encounter, not as a recognition of a distance, and, on the other hand, to discover a way to build unity, a characteristic well represented by Space exploration which increasingly involves working and living together. The experience and reasoning about “reaching out” and “touching” outer Space could therefore offer opportunities to help humanity meet and relate in a new way on Earth, opening new horizons towards transcendence; in this sense, we intend to speak of Integral Sustainability when we consider a context extended to the dimensions of foundations, and, therefore, open to a reasonable and strong theology.

Finally, I will discuss Space Sustainability, so expanded, as an opportunity to pave the way for an ethical reflection, that could “return” back to Earth to nourish humanity with new paths, precisely ethically sustainable, with a humble attitude in the inviting mystery of the Cosmos, along the way, more and more accelerated, of human progress. Indeed, this progress urgently needs to find a solid ethical foundation, and for this to happen, the coordinates relating to its metaphysical and theological dimensions must also be consolidated together with those of the physical universe. In this text, I will refer to the event of the Incarnation of Christ as the personal self-revelation of God the Trinity in the history of humanity as a rational and consistent foundation of the intelligibility of the Cosmos and of human life, as well as of its integral progress towards the true good. The declared theological reference in the following discussion is therefore the Christian one.

2. Analysis

2.1. The Parker Solar Probe Mission

The Parker Solar Probe ([NASA 2018a](#)) was launched towards the Sun at 07:31 UTC on 12 August 2018 to complete 24 perihelia ([NASA 2018b](#)). On 14 December 2021, the extraordinary event known as “touching the Sun” was announced as a “monumental moment for solar science” when the Parker Solar Probe reached, for the first time in history, what is known as the *Alfvén* critical surface, where the magnetic field is high enough to dominate the movement of the particles, providing evidence of entry into the solar atmosphere. This “touch” occurred at 18.8 solar radii (8.1 million miles), but it is worth noting that this is not the case of an atmosphere to be considered as a sphere, which means that it is not so easy to define and to verify the threshold of the solar atmosphere boundaries. The successive “touches” took place at about 15 solar radii (6.5 million miles), dipping into the Corona *pseudostreamer*, that is, a feature of the Corona itself with massive structures also visible from the Earth during the solar eclipses. The apogee of the mission, during the subsequent scheduled perihelia, is to attempt to define an even deeper touch up to 8.86 solar radii (3.83 million miles) in 2025.

The Parker Solar Probe is equipped with 4 main instruments to study, respectively: (1) the magnetic field; (2) the Plasma; (3) the energetic particles; and (4) the images of the solar wind. For these reasons, they are protected by a carbon-composite shield that can withstand temperatures up to 2500 F (1377 °C). The solar wind is a flow of ionized gases whose perturbations shake the Earth’s magnetic fields and pump energy into the Van Allen radiation belts (a zone of energetic charged particles) in the Earth’s magnetosphere. All of this contributes to the definition of Space Weather and the Space Environment, which allows us to study the close relationship between the Sun and the Earth, and, therefore, the dynamic relationship between the “touching” of one and the “touching” of the other, not only at the physical level, but also at the metaphysical, transcendental, and ethical levels, considering the complexity related to the concept of “touching” in the Cosmic Space. In fact, in this work, I will follow exactly this line of exploration along the multi-dimensional “distance” between the Earth and the Sun, which gives us the opportunity to evoke a wide range of reflections on the close link between the human person, who wants to and can touch the instruments that strengthen his possibilities and offer the opportunity to

expand his personal and communitarian sensory experience, and the human interiority, solicited by the extra dimensions that emerge from the new horizons opened up by space missions. I will therefore consider how the Parker Solar Probe can deal with an “expanded touch”, (1) because this event, related to a definite/indefinite surface, reminds us of a deeper understanding of the meaning of the boundaries, (2) because our bodily senses are not directly involved but extended, and (3) because this “touch” also indirectly refers to Earth and our future.

2.2. Examples of “Touching” the Cosmic Space

Let us now explore some of the very first space missions in history, in which various events characterized by “touching” in outer space were experienced, following the temporal order. The first “touch” of Cosmic Space itself took place with the launch of the first artificial satellite to orbit the Earth, Sputnik 1, which occurred on 4 October 1957 at 19:28:34 UTC from the missile base, now cosmodrome, of Baikonur in Kazakhstan, in the then Union of Soviet Socialist Republics (USSR), with an R-7 Semërka (intercontinental ballistic missile) carrier 34 m high and 3 m in diameter (NASA 1957).

The first man to ‘enter’ outer Space, on behalf of all mankind, was Jurij Alekseevič Gagarin, aboard Vostok 1, which was also the first spacecraft to enter Earth’s orbit, launching from the Baikonur Cosmodrome on 12 April 1961 at 06:07 UTC. It completed an orbit (between 169 km and 327 km high) in 89.1 min and returned back to Earth after a total flight time of 1 h and 48 min of flight (NASA 1961).

The Soviet probe Lunik 2, which was launched on 12 September 1959, “touched” the Moon on 13 September at 22:02:24 UTC, at impact coordinates 29.1° N, 0° W, close to the Sea of Serenity of our natural satellite (NASA 1959). This was the first time that a man-made object touched the surface of another celestial body, the first indirect Cosmic “touch”.

The first opportunity for a human person to directly “touch” outer Space (albeit through the spacesuit) was with the first walk in the void of Space, called EVA (Extra-Vehicular Activity), which was performed by Aleksej Archipovič Leonov at 08:33 UTC on 18 March 1965, with the Voschod 2 mission, launched on the same day at 07:00 UTC and returned on 19 March (NASA 1965a). He remained in “absolute space” for about 16 min «during which Leonov experienced tension and euphoria», during the 18 planned orbits between 475 km and 167 km altitude.

Lunik 9, launched on 31 January 1966, made the first “soft landing” on the Moon, on 3 February at 18:45:30 UTC in the *Oceanus Procellarum* west of the Reiner and Marius craters (7.08° N–64.37° W in lunar coordinates), taking the first photographs of the surrounding landscape (NASA 1966).

With the American Apollo 11 mission, the first human being was able to touch the Moon with all the emotional load, not only personal but certainly “vicar”, that is, on behalf of the whole of humanity which recognized in this event both a scientific and technological goal, and above all, the common tension towards the sky. The Lunar Module (LM) landed on Sunday 20 July 1969 at 20:17:40 UTC at the coordinates 0.8° N and 23.4° E, Tranquility Base, *Mare Tranquillitatis*. N. Armstrong exclaimed: «Huston, Tranquility Base here—The Eagle has landed» and at 02:56:15 UTC on 21 July, he became the first man to set foot on the Moon as commander of the Apollo 11 mission, exclaiming: «That’s one small step for [a] man, but [a] giant leap for mankind» and was followed, 19 min later, by Buzz Aldrin at 03:15:16 UTC. The two astronauts spent a total of 21 h, 36 min, and 20 s on the lunar surface, including 2 h, 31 min, and 40 s on EVA (the two astronauts returned to the LM at 05:11:13 UTC). The LM left the Moon on 21 July 1969 at 17:54:01 UTC.

The USSR organized the first “landing” on the planet Venus, with the Venera 3 mission, which was launched on 16 November 1965, but after a long journey, however, failed to make the planned landing and crashed on the planet on 1 March 1966, probably between the coordinates 30° S and 20° N, 60° E and 80° E (NASA 1965b). This was the first man-made object to reach another planet in the Solar System (the Moon being a natural satellite). Instead, the subsequent Soviet mission Venera 7 was successful; it was launched

on 17 August 1970 and landed on schedule on 15 December 1970 at 05:34:10 UTC at 5° S and 351° E on the planet Venus, transmitting good signals from its surface to Earth for about 35 min before gradually losing contact (NASA 1970).

The first impact on the red planet, Mars, always occurred with a USSR mission, thanks to the Lander of Mars 2 (launched on 19 March 1971) which unfortunately crashed on its surface on 27 November 1971 due to a malfunction of the descent system (NASA 1971a). Mars 3, launched on 28 May 1971, finally made the first soft landing on Mars on 2 December 1971, at coordinates 45° S and 158° W, with the first radio communication with Earth (NASA 1971b).

NASA's Messenger mission, launched on 3 August 2004, reached and entered Mercury's orbit on 18 March 2011 at 00:45 UTC, and crashed to the surface on 30 April 2015 at 19:26 UTC (NASA 2004a).

The very important Cassini-Huygens mission, with an international collaboration, NASA-ESA-ASI, was launched on 15 October 1997 from Cape Canaveral and entered the orbit of Saturn (24,000 km from the surface) on 1 July 2004 at 21:12 UTC, after a journey of 3.5 billion kilometers (NASA 1997). The Huygens probe, detached from the mother probe, landed on Titan (Saturn's satellite) on 14 January 2005 at 12:34 UTC, while Cassini then continued its mission until it finally "touched" Saturn with the so-called "Grand Finale", which began on 26 April 2017, making 22 passes through Saturn's inner rings and then being destroyed upon entering its atmosphere on 15 September 2017 at 11:55:46 UTC, when its last signal was received.

ESA has guided the Rosetta/Philae spacecraft to a soft landing on Comet 67P/Churyumov-Gerasimenko. The launch took place on 2 March 2004 and the Philae Lander landed on the comet on 12 November 2014 at 15:34:06 UTC (NASA 2004b, 2004c).

The NEAR Shoemaker mission, launched by NASA on 17 February 1996 (NASA 1996), was the first spacecraft to orbit a small asteroid (433 Eros) at a distance of 35 km from the surface on 14 February 2000; it then landed on the asteroid itself on 12 February 2001 at 20:01:52 UTC.

2.3. The Mysterious Concept of Boundaries

The monumental "experience" for Solar Science that occurred with the "touch" of the *Alfvén* Surface opens the discussion about the meaning of such a "touch", considering and exploring the not-trivial concept of boundaries in the Cosmic Space and especially in human experience.

Piaget (1967) and Comte (1838–1842), raise the problem of the relationship between living organisms and the environment (especially in biology) in a very serious way, underlining how the discourse on life itself depends on it, which is understood precisely in a "relational context" and, therefore, I would add, in a context that is necessarily ethical. This "relationality", understood in a broad sense, is in fact directly linked to the problem of boundaries and to that of the finite/infinite relationship, which acquires particular relevance in both a spatial and terrestrial context. The reference to the concept of relationships introduces, in the context of this article, a fundamental dynamic of the Cosmos which is understood as the Creation of the Triune God who revealed Himself in Christ. Trinitarian Relationships are thus the origin and meaning of all relationality intrinsic to the universe, particularly and pre-eminently that between God Himself, in the three divine Persons, and the human person, from which follows a new possible relationality between human persons and of the latter with Creation.

If, on the one hand, it is not so obvious to define a boundary, on the other hand, it represents a cognitive and relational challenge, especially between man and the world around him; in fact, besides the diversity that is the very motor of the possibility of meeting and of a relationship, even the belonging of the boundary itself is a problem with profound physical and metaphysical implications. In fact, it is possible to define (1) the properties of the boundaries—i.e., to whom they actually belong (with respect to two entities A and B); if the boundary belongs only to A, B is unbounded; if they belong to A and B, there are points

simultaneously belonging to both; if they belong to neither, the boundary constitutes a third entity about which to study the boundaries themselves; if there are two mereologically distinct but spatially co-located boundaries, we violate Locke's principle of one object to one place (Locke's Principle of Individuation affirms that two material objects of the same kind cannot occupy the same place at the same time) (Locke 1847, pp. 206–7); and (2) the reality of boundaries (real or imaginary), whether they are clear or vague, and consequently whether or not they have geometric dimensions or not.

The boundary is therefore not easily identifiable and locatable, as one might expect, but it is a "paradoxical place", and a complex reality.

Indeed, when philosophers address the question of the boundary of bodies, they raise a number of questions (Ramellini 2014; Varzi 2005, 2007): owned/unowned boundaries (Whose is the A/B boundary?); genuine/imaginary boundaries (Are they mere projections of the mind?); sharp/vague boundaries (Where exactly is the boundary of a cloud or of a star?); bodiless/bulky boundaries (Are they lower-dimensional entities or extremely thin but concrete layers?). For example, regarding the boundary of living bodies, there are different types of boundaries, namely: (1) Physical; (2) Perceptual (visual and haptic); (3) Compositional (relating to material discontinuities); (4) Cellular (especially bio-membranes or plasmalemmas); (5) Processual/Functional boundaries (dynamic, functional or operational boundaries); (6) Organismic boundaries (the boundary of an organism *qua* organism).

Finally, speaking of the Universe, its dynamics present structures characterized by boundaries of various kinds:

«Stellar matter, stellar crowns and winds, the interstellar medium, galaxies, active galactic nuclei (jets and accretion disks), the intergalactic medium, the large-scale distribution of galaxies, the fossil radiation of the primordial big-bang are described through fluid-dynamics theories, as the interactions between the various elements (ions, atoms, molecules, but also stars and galaxies when referring to the dynamics of astrophysical aggregations dominated by gravitation) generally guarantee collective behavior» (Ferrari 2011, p. 185).

These structures therefore have boundaries that are very difficult to identify, which include the following: (1) Fluid dynamic processes, which are one-dimensional (collimated supersonic astrophysical jets, associated with active galactic nuclei, star-forming regions, active stars), supersonic winds or flows with spherical symmetry (generated by the Sun and hot stars according to the 1958 Parker model), gaseous accretion disks, and spherical shock waves (supernova explosions) (Ferrari 2011, pp. 188–207). (2) Plasma processes: 99% of cosmic matter is in a state of high ionization and high particle mobility, i.e., in the form of plasma, where the presence of free electric charges can produce collective effects. In the case of the "surface" of the Sun, for example, observational data show that «sunspots, protuberances, brightening, radio bursts, coronal holes, etc. and the spiral structure of the solar wind are due to the dynamic interaction between the plasma and the magnetic field» (Ferrari 2011, pp. 209–33). (3) Stellar phenomenology: «there are classes of stellar objects with peculiar characteristics, both for their emission and for their dynamics and finally for their average life» confirming the evolution of cosmic structures (Ferrari 2011, pp. 273–93): variable stars; peculiar or active stars: dynamic phases with high-energy processes that deviate from the pattern of spherically symmetric objects (star-forming regions, planetary nebulae, supernovae or supernova remnants, Pulsar, Gamma-Ray-Burst); narrow binary systems: in bound orbits around the common center of mass. «Their atmospheres are deformed by tidal effects or even mixed by tidal effects; in this case the structure and evolution of the stars are influenced by the dynamic interaction . . . the mass exchange phenomenon». (4) Stellar atmospheres: it is the study of a system of matter and energy in non-equilibrium conditions. The stellar structure loses energy by radiation to the surface, so that the physical conditions are undergoing a slow, continuous transformation, and the surface activity is also influenced by the effects of rotation and magnetic fields, despite the fact that the entire structure may have a spherical symmetry at the macroscopic level.

(5) Black holes, which, as the “remnant” of the evolution of massive stars, represent another fundamental question mark on the horizon of the definition of a “border”, to be studied and “touched”. (6) Star populations and clusters (open and globular). (7) Interstellar medium: 10% of the matter of the Milky Way, for example, is distributed in interstellar space in the form of clouds and diffuse medium (gas, dust and interstellar molecules). The distribution of the interstellar medium is very irregular. (8) Galaxies as fundamental structures of the Universe on large scales, containing, in addition to the stars, large quantities of neutral gas, dust, molecular clouds, magnetic fields and cosmic rays. (9) The presence of dark matter, which represents about 26.8% of the mass-energy of the Universe.

Faced with such a complexity of the physical order, we can now ask: what does it mean, then, to “touch” outer Space? The question is demanding, and it fits into a horizon that not only has the characteristics of a “something” to be achieved, but much more, as it evokes an extremely significant anthropological dimension because, with the possibility of entering Cosmic Space, the aspirations of every human person transcend boundaries themselves and emerge in an amplified way, in the double sense of (1) going beyond the limit of the finite by orienting ourselves towards the innate desire for the mystery of the infinite: borders are also “sources” of “*de-sideribus*” since they awaken the longing for the whole, for the “eternal” and therefore for the “Absolute”; the Absolute is understood as the natural reference to the great and decisive questions about the origin and meaning of the universe and human life, as well as about divinity and God; and (2) building meaningful relationships: recognizing borders as a “source” of diversity, since they characterize unique and unrepeatable originalities, even in the context of complexity, and especially in that of human Persons; in this sense, borders are opportunities for relational encounters between ‘I’ and ‘Thou’, and not just “limits”.

2.4. *Touching the Sun, Touching the Cosmic Space and Touching the Earth*

The concept of “touching” something, although it is a very common and decidedly natural concept in human experience, thus reveals a series of critical issues from a physical (the consistency and the continuity of the boundaries) but also from a metaphysical point of view, if carefully analyzed. If borders would not exist one could not have the valuable experience of diversity as richness, where the very standardizing and flattening of diversity promotes confusion and destabilizes relationships by breaking down borders.

In the specific case of Space exploration, the problem of borders is highlighted precisely by the immensity of the Cosmos and the peculiar consistency of the distribution of matter and energy in the universe. The desire to “touch” the Cosmos is in fact rooted in the deepest strings of the human heart, when, as children, we stretch out our arms not only to point at the stars, but also to express the desire to reach out and grasp them. At the same time, the impulse that urges us to orient ourselves towards a boundless horizon expands what we might call our perceptual dimensionality in the dual direction of broadening and transcending it. The former consists in the technological/creative movement that leads to the extension of perceptual possibilities through the use of new tools that allow us to “touch” even the unattainable; we thus have a first stage of an important semantic change regarding “touching” itself, which is no longer limited to what is within my direct reach. The transcendence of perception, which is also typical of, though not exclusive to, Space exploration, has instead to do primarily with the activation of the perception of the infinite, which enhances every concrete experience of boundaries with our innate tension towards fullness, through the opening and the reference to the Mystery, understood as an opportunity for further and always newly oriented leaps. This is the second level of the semantic change in “touching”.

The human person continues to be the one who lives the “experience of touching” but not necessarily the “fact of touching” and this distinction, which is characteristic of the development of technology, allows us to emphasize that the person, thanks to his intelligence and conscience, is always at the center, even if, technically speaking, it is the “instrument” that “touches”.

Reality, therefore, presents itself as a carrier of multi-level meanings (the complexity of the Cosmos is in fact revealed as an interconnected network of different levels of intelligibility) and the approach to them through the extended human and artificial perception cannot do without the semantic level, concerning the ontological, transcendental, and spiritual dimensions, precisely in the horizon of the complexity of reality itself, as will be seen in the next section.

This experience of multi-level expansion necessarily concerns the value and ethical dimension, as well as the fact that it always involves the human person who remains at the center of every relationality (between people) and of every relationship (with reality), so that every choice is ethically connoted in itself, even for the delicate and compelling management of technology which, while revealing further aspects of the Cosmos, “demands” for qualified and qualifying ethical attention.

We can also find these levels through the resonances offered by the first astronauts. Yuri Gagarin, during his historic mission which led him to personally enter, letting all humanity “enter” with him, the Cosmic Space “touching” it for the first time, realized that his own senses, together with the “senses” of his spacecraft, were naturally extended and enhanced beyond the physical and artificial ones. In fact, there is a part of his speech before the launch, that is iconic for these connections, at least in the following expressions:

«Dear friends, known and unknown, compatriots and people from all countries and continents! In a few minutes a powerful spaceship will take me to the distant expanses of the Universe. What can I tell you in these last few minutes before the start? My whole life seems to be condensed into one wonderful moment. Everything I have experienced and done so far has been in preparation for this moment. You realize that it is difficult to express how it feels now—when the time of trial, for which we have trained long and passionately, is so close. I don't have to tell you how I felt when I was suggested to take this flight, the first in history. Joy? No, it was something more. Pride? No, it wasn't just pride. I felt great happiness. Be the first to enter the cosmos, fight alone in an unprecedented duel with nature—could anyone dream of something greater than this? But immediately afterwards I thought of the enormous responsibility that fell on me: to be the first to do what generations of people had dreamed of; to be the first to pave the way for humanity in space . . . Tell me a more difficult task than the one I have been faced with. This is not a responsibility for one, not for dozens of people, not for a team. It is a responsibility . . . for all humanity, for its present and future . . . I would like to hug you all, people known and unknown, far and near. Until we meet again!» (Gagarin 1961).

When he was “touching” the Cosmos, he could then resonate in a new way with regard to the Earth, as follows: «The sky is black, and along the edge of the Earth, near the horizon, there is a beautiful blue halo» (Vladimirovič 2011, p. 81); «From up here the Earth is beautiful, without boundaries or borders» (Greppi 2019, p. 37).

Similar resonances, indicating the unity of mankind in its dignity and preciousness, can be found in the Apollo 8 mission, in which the three astronauts, Frank Borman, James Lovell, and William Anders, wanted to read the biblical text of Gn 1:1-8 while orbiting around the Moon in connection with the Earth for the benefit of all humanity. It was 24 December 1968 and Anders' invitation opened this truly extraordinary Christmas Eve for the astronauts and also for all humanity with these words: «We are now approaching to Lunar sunrise and for all the people back on Earth the crew of Apollo 8 have a message that we would like to send to you» and then, taking turns all three of them, they read the text from a distance of 313,800 km from the Earth and 96.5 km from the Moon, just as they had seen the Light of the sun rise in the Darkness of the Universe.

Finally, we must not forget the astronauts who “touched” the Moon for the first time. On 21 July 1969, during the Apollo 11 mission, after landing, Buzz Aldrin and Neil Armstrong were required by mission protocol to rest and sleep for at least seven hours before walking on the lunar surface. At this point, Aldrin called Huston and invited

everyone to share a moment of gratitude before an event that would go down in history: «This is the LM pilot. I'd like to take this opportunity to ask every person listening in, whoever and wherever they may be, to pause for a moment and contemplate the events of the past few hours and to give thanks in his or her own way. Over».

There are obvious traces of an expansion of the perceptual dimensionality favored by the exploration and the experience of Cosmic Space, with the advantage of a new hermeneutic key to reread the depths of life on Earth, adding a metaphysical horizon that derives directly from the synergistic experience of an expanded perception, in the face of the “touching” of an intangible reality!

The metaphysical dimension of “touching” the Cosmos is, in my opinion, even more evident in the tragic and exciting reflection of M. Collins during his experience of absolute solitude around the Moon on the side where any communication was impossible:

«I am alone now, truly alone, and absolutely isolated from any known life. I am it. If a count were taken, the score would be three billion plus two over on the other side of the moon, and one plus God only knows what on this side. I feel this powerfully—not as fear or loneliness—but as awareness, anticipation, satisfaction, confidence, almost exultation» (Collins 2001, p. 402).

3. Proposals

In this section, after the previous brief analysis of the Parker Solar Probe mission and a summary of the first missions that have reached and “touched” outer Space and some other celestial bodies, as a consequence of the expanded concept of boundaries derived from both the physical and evocative dimensions of the Space explorations, I now approach two main proposals in order to develop a Space Sustainability as an ethical guide for relationships along the path of mystery and humility.

The first is to move towards an epistemological shift along an expanded perceptual dimensionality; the second is a possible subsequent method derived from such an empowered vision of the interconnected reality (Universe).

3.1. *The New Perceptual Dimensionality to Reach the Mystery of the Cosmos*

We have seen so far that the concept of boundaries is in fact a “paradoxical place”, especially when it is applied to the horizon of the Cosmic Space, where further evidence of a space without borders opens up, thus allowing the human explorer to deal simultaneously with the limit as an opportunity for a relational encounter, and with the infinite as an inner longing for fullness.

Relation and Fullness are two concepts, but also two complementary experiences, which naturally include the ethical dimension that gives meaning to these purely human dynamics in terms of conscious and mature choices.

In this sense, the approach to reality in its complexity and breadth seems increasingly possible only in a cross-disciplinary context. In fact, it is reality itself which, initially “read” only at the level of bodily sensitivity, has been reached, thanks to the growth of technological progress, through the development of the artificial perception, which has enhanced bodily perception in two ways: (1) extending it, thanks to new levels of reading and thus, new data obtained; (2) enriching it, thanks to the ever new availability of signals which, although not directly perceptible, in fact offer to the researchers new opportunities for synthesis and intelligent processing.

While we are discovering more and more the essential link between the perception that the human being can have of reality and the consequent dimension of meaning and ethics, we are recognizing the existence of another perceptual dimension that cannot be overlooked, that of spiritual perception. Outer Space is precisely the privileged place where this extended link is evident:

Human Perception ↔ Ethical and Meaning Dimensions ↔ Spiritual Perception

At the methodological level, it is then possible to introduce the concept of Sensory Fullness, which refers to the expansion and strengthening of the human perceptive faculties in the double direction of development and integration between natural or sensory perception (bodily senses), artificial or technological perception (sensors and detectors) and spiritual perception (spiritual senses) (Tedoldi 1999; Montanari 2012). The latter is a very important and often forgotten dimension although it has a strong and grounded theological tradition starting with Origen, Evagrius and St. Bonaventure. The *Doctor Seraphicus* in particular considers the spiritual senses not as *facultates*, symmetrical and parallel, but as *usus* of Grace, and thus capable of offering a progressive and complete maturation of human perception.

It seems useful to specify the meaning of the term Spirituality which is conceived as a network that connects all aspects of life and extends into every dimension of the human being—somatic, psychological, and socio-cultural—and which fits well with the notion of the unity of the multifaceted human being. In C. Saunders’s vision, spirituality is anchored in both personal reality, which describes the commitment to achieving personal goals and visions, and social reality, in the way that it is experienced by the community, in which personal inspiration, mediation, and historical realization are achieved (Saunders 2005, pp. 39–50). Spirituality is multidimensional, consisting of existential challenges, value-based considerations and attitudes, religious considerations, and foundations (Mantini et al. 2022), but also theological research and experience.

My epistemological proposal is therefore to go beyond the dualistic vision of the contemporary technological era, which considers the physical senses as a weak support for the much more developed and often overvalued artificial (or virtual) senses, to a vision that can be represented by a matrix of 2×5 dimensions, which I call the *Reduced Matrix of Perception* (RMP), where each line is a line ‘vector’ 1×5 composed of the five bodily and artificial senses, respectively:

$$\text{RMP} = \begin{bmatrix} \text{Bodily Senses} \\ \text{Artificial Senses} \end{bmatrix}$$

It is then possible to consider a more complete vision of the perception, according to which the physical senses are recognized as closely linked to the spiritual senses, and only this “enhanced unity” is decisive for the full comprehensibility of the readings coming from the development of artificial sensors, of which astronomical instruments are full. The intention here is not to introduce a dualism between the sensible and the spiritual, but rather to indicate the flowering of the sensible through its expansion into the spiritual that directly emanates from the event of the Incarnation. Indeed, it is Christology that allows a new spirituality of the sensible to develop. In what follows, therefore, I intend to distinguish the perceptive levels, which will be inserted into a matrix scheme, for the sole purpose of expanding and thus considering the richness of the Christological configuration of the human senses. From the human bodily/spiritual perceptual enlargement, we thus have a matrix 3×5 , that I call the *Complete Matrix of Perception* (CMP) composed of three line vectors 1×5 , as follows:

$$\text{CMP} = \begin{bmatrix} \text{Bodily Senses} \\ \text{Spiritual Senses} \\ \text{Artificial Senses} \end{bmatrix}$$

where the second line (the five spiritual senses), in addition to holding all the components of the matrix together, strengthens the first line in an extremely fruitful way by increasing the sensitivity of the physical senses, and favors the third line through a renewed and profound creativity in the definition and in the use of the artificial senses.

Whereas in the first matrix we could see the risk of an imbalance on the second line (artificial senses), in the second matrix, the emphasis is instead necessarily placed on the synergy between all the lines. If we consider the senses as the rungs of a cognitive ladder

(in which the process of knowing reality takes place in a close connection between sensory experience and intellectual elaboration), sensoriality «marks us, sends us back, expresses us, measures us», in a connection between the *foris*, that is, the outside in which we are immersed, and the *intus*, that is, a profound interiority that it is not only pure reception but full and extended sensitivity. The “variegated sensorial symphony” draws on that mystery of communication in which the one comes out of solitude to enter into communion, between the macrocosm and the microcosm of the person (Tedoldi 1999, pp. 14–15) and of the Cosmos.

Talking about spiritual senses requires connecting apparently distant concepts, but as in every aspect of Space exploration, it is the wonderful connection between distant objects that opens the doors to comprehensive knowledge: «the *sensus*, in fact, measures the segment of space-temporality in which I am immersed and the presence of an object in the context of contingency, while the *spiritualis* connotes the tension of the infinity» (Tedoldi 1999, p. 16).

The natural senses can certainly be assisted by the artificial senses, where they achieve a greater range of perception and a deeper sensitivity of perception. The former, in their complexity, provide in addition to sensory data, a whole experience made up of memory, affectivity, dreams and desires, as well as intuition and intelligence, in order to elaborate what is called a “sensory image” which is indeed greater in quantity, but above all in quality, compared to the simple sensory data perceived. The artificial senses, on the other hand, mediate the complexity of the world, breaking the direct link with the human “experience” to which the natural senses are structurally related, and reaching the researcher in a way depleted of depth, even if enriched with objectivity when the measure is well done. This depth is partly recovered in the resonance that the empirical data collected can produce in the scientists who then “read” and interpret the results of the artificial senses, although this “experience” is still very different from that produced in the one who “lives” it (perceiving it with his own natural senses). On the other hand, objectivity can be of great value if it is defined with the right degree of reliability, which, in science, is always of a statistical nature.

However, artificial perception also conceals an unexpected depth even if not in its “living” aspect, that is, linked to the direct experience of the observer. Thanks to various techniques for processing the “raw” data collected by the sensors, it is indeed possible to recover “hidden” information, especially from a qualitative point of view, by drawing up maps with very rich meanings (see Principal Component Analysis, Neural Networks, Artificial Intelligence, Machine Learning techniques, etc.).

Natural perception and artificial perception together become a richness that can never do without the intelligence and sensitivity of the human person, which makes the quantitative and qualitative dimension of the data collected an expression of that vitality of the Cosmos that speaks of its “intimacy” and of its thickness, but also of its role as a bridge to infinity. In this perspective, the spiritual senses fully integrate physical perception by making «the senses rise to the spirit and . . . embody the spirit in the senses», that is: «to introduce the dimensions of knowledge drawn from the spirit into the knowledge worked by the “flesh”; to make the cognitive segment of the *hic et nunc* experience infinite so that it does not get lost in the oblivion of insignificance». Here too, there is a clear desire for unity. It is therefore more necessary than ever to return to «guaranteeing the foundations of a theory of the unity of consciousness and of the “perception of the spiritual qualities of sensitive realities”», because otherwise the world would be lost, and we risk “closing” the human body, which becomes ‘an-aesthetic’, ‘anesthetized’ and deaf (Pagazzi 2012, p. 314).

We are in great danger of living in the world by often placing too much emphasis on scientific data, mistakenly considering them as the source of a perception that is “essentially impersonal and totally neutral”, but in this way, in addition to the methodological error, we add the “loss” of the world itself, which we think we have “conquered” instead.

The theme of perception in its extended dimensions is therefore anything but trivial; it touches the depths of the human persons in their relationship with the world. The senses, in fact:

«Embrace each other and noticeably tie up the relationships they frequent. They don't like to be alone. Instead they go to pierce a circle of mutual donation and mutual assistance, arousing the envy and jealousy of the banal life. For this reason, they appear in the history of the soul as the most experienced pioneers for dense ties of heaven and earth» (Cornati 2012, p. 13).

In this context, it is important, if it is still necessary after what has been said, to emphasize once again the unity of the human perceptive dimension, against any dualism between physical and the spiritual senses, while artificial perception represents that reinforcement, albeit of different efficacy, which is useful and precious for the purposes of an enlargement of the external and internal human sensitivity.

Today, the "world of perception" has been diminished along at least two lines: on the one hand that of the «metaphysical and abstract reduction» of spiritual sensitivity, and on the other hand that of its «sentimentalistic extenuation». Instead, logical order (*lógos*) and affective resonance (*pathos*) are intimately linked by the human conscience, which moves along three successive passages (Zurra 2012, pp. 343–79), that collect and integrate the human perception. The latter is, in fact, considered as unitary in its pluridimensionality, that is, beyond its intellectualist-spiritualist or materialistic-biological reduction. The three passages are thus: *Affectus*, the affective activation of conscience; *Desiderium*, which emerges from the center of affective experience as an anthropological opening to transcendence and God; *Fides*, the fulfilment and implementation of the *affectus* and *desiderium* in the relationship between conscience/freedom and the work of the Spirit.

Therefore, the integration of the human faculties into the believing conscience starting from the use of the Complete Matrix of Perception (CMP), offers itself as a challenge that is not only fascinating, but much more necessary for an anthropological/scientific/ethical retraining and rediscovery.

3.2. The Elastic Methodology . . . in Humility

One of the main ideas left behind by the Parker Solar Probe Mission is not only to get closer to a star for the first time, but also to revolutionize «our understanding of the Sun, where changing conditions can propagate out into the Solar System, affecting Earth and other worlds», with particular reference to the solar wind, in order to «make critical contributions to our ability to forecast changes in Earth's space environment that affect life and technology on Earth . . . The Sun is a source of light and heat for life on Earth. The more we know about it, the more we can understand how life on Earth developed» (NASA 2018a).

This connection has a double implication: the technological dimension of direct and indirect measurements, and the dimension of the meaning related to ethical and hermeneutical concerns. I will call these extended dimensions of Space missions as "Metaphysical Space Resources" precisely to take into account the call that the Cosmos constantly addresses to humanity, in the direction of a humble search for meaning and thus for Truth.

If we consider the whole Sun-Earth System as being intimately connected, both for life and for society, not only from a functional point of view but also from an epistemological one, it offers a link that allows an extended knowledge that, while leaving the Earth to go towards the Light and its source, helps us to illuminate these metaphysical, transcendental, and ethical dimensions for an enhanced return to the Earth.

The Sun does not have a solid surface, but it is a ball of hot plasma held in place by the Sun's gravity, and the Alfvén critical surface, which defines the Sun's atmosphere, "marks" its mysterious boundaries where the solar material is still bound to the Sun itself, in the form of a wrinkled surface. In the same way, in order to better understand the proposal I am dealing with, "touching" the Sun does not only mean to "touch", even if in a critical sense, the Alfvén surface, but it also means to "touch" an extended "epistemological surface" capable of empowering a cross-disciplinary research:

$$\text{Sun} \xleftrightarrow[\text{System}]{} \text{Earth} = \begin{cases} \text{Functional bonds} \\ \text{Epistemological bonds} \end{cases}$$

$$\text{Touch the Sun} = \begin{cases} \text{Touch the Alfvén Surface} \\ \text{Touch an Epistemological Surface} \end{cases}$$

This “touch” thus expands and offers sides for further cognitive approaches that may have repercussions in a new conceptualization of the meaning of Sustainability:

$$\text{To “Touch”} \rightarrow \begin{cases} \text{Physical meaning} \\ \text{Epistemological meaning} \\ \text{Metaphysical meaning} \\ \text{Transcendent meaning} \\ \text{Ethical meaning} \end{cases}$$

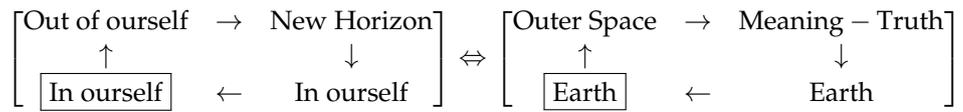
To speak of epistemological bonds is to refer to the possibility of recognizing a surplus of knowledge available, as we have seen, in the universe. The Earth–Sun system may represent just such an example of this extension in the direction of deep intelligibility. The “surface” of the Sun, in this context, offers just such a further possibility of knowledge, precisely as if it were an “epistemological surface”. Similarly, the concept of “touch” explored here is an opportunity to develop a new and extended epistemological meaning.

In the face of this interpretation provided by Space exploration, the methodological approach that I will follow in the attempt to describe a Cosmic Space Expanded Sustainability is inspired by a logical–mathematical operation that has changed the approach of scientific research starting since the 1900s: the Gödel’s Theorem (Gödel 1931), according to which no reasonable mathematical theory, which at least knows how to deal with natural numbers and is free of contradictions, will be able to “self-certify” its absence of contradictions. Moreover, it will encounter problems that it will not be able to solve.

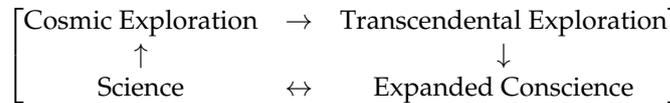
The “true” is finally restored to its amplitude and transcendence, no longer bound to what is demonstrable, but extended to different epistemological levels, as a strong appeal to integrate also every knowledge with the intelligible Revelation of the very Person of God with the Incarnation. Moreover, truth is at last freed from the danger, now more evident than ever, of being reduced to opinion, of being relativized in an undue and often ideological operation of horizontal and contingent “crushing”, as it could exist alone within a strict and unnatural closed system. Truth, on the other hand, since it escapes the possession on the side of those who study it, while at the same time stimulating research, requalifies the “horizontal in horizon”, discovering that the system Universe is an open mystery that reveals a transcendence that frees it from the myopia of its self-referential gaze. Indeed, it requires a humble attitude in order to “relate” to it.

It is a matter of overcoming «logical neo-positivism, the self-referentiality of the logico-mathematical enterprise and the illusion of a complete formal language, capable of self-grounding regardless of a meta-empirical horizon, of metaphysical inferences» (Tanzella-Nitti 2003, p. 26). In other words, it is necessary to leave the axiomatic system in order to find its foundation, since, contrary to what David Hilbert (1862–1943) argued in his attempt to “master the infinite” through a “coherent” and internally closed mathematization, self-certification of consistency is no longer possible. A logical (mental) system must have recourse to a system of a different nature (*meta* system) in order to establish itself.

Along this hermeneutical approach, everything is played out in the transition from “in itself” to “outside of itself” in order to then return, renewed, to “in itself”. Here then is the heart of what I will call the Elastic Methodology (Mantini 2022, pp. 291–95), which also corresponds plastically well to the exploratory movement of the astronauts, who begin by tending towards infinity and then return back to Earth. The scheme is as follows:



or:

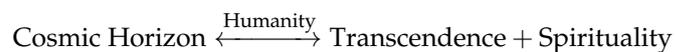


A rubber band, starting from its initial state “in itself”, expands to come out upwards, that is “out of itself”, in a tension animated by a perspective of expansion, and when it has reached this “outside”, where it discovers a new horizon and a new perspective, it comes back “in itself” enriched in some way by this dynamic exercise.

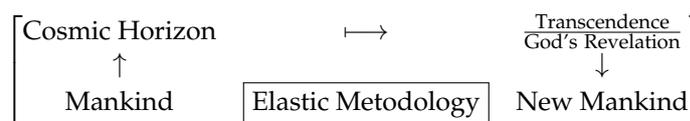
In other words, starting from the Earth, man enters outer Space (that is, precisely the “outside”), which opens up the stimulating but still closed system of his knowledge, dealing in a new way with the question of meaning and transcendence, precisely through the Cosmos which increasingly reveals itself in its profound and mysterious truth, and also allows a rational exploration of its possible dimension of “Creation” made by a revealed God. With this new vision derived from the opening of the system, and therefore of knowledge, beyond the purely scientific/positive level, man returns to the Earth with a new anthropological reading and a new expanded conscience.

In fact, scientific research today is experiencing profound epistemological changes in the delicate but precious context of the reconceptualization of knowledge, which leads to the need for a new opening (Mantini 2021). Consequently, science, which already “in itself” perceives its tension towards completeness in the awareness of its radical incompleteness, can expand beyond its narrow boundaries, maintaining its own method and its own prerogatives, but “integrating” them into a new, extended horizon.

In our context, scientific research, enlarged to the dimension of the Cosmos through Space exploration, goes out of itself in a sort of real neutral “ground”, that allows humanity to “wander” and work together in unity of purpose, thus expanding also relationships and ethical issues, together with intelligence, knowledge and technological tools. The peculiar characteristics of the cosmic horizon, thanks to the resonances they create within the human person, inevitably touch the strings of transcendence and spirituality, which in turn reach and illuminate the very reality of the Universe itself:



Transcendence and spirituality, which appear before the astonished researcher as an open and appealing ulteriority, must then be substantiated not by another “work of human hands”, as if one wanted to “build” a god with one’s own hands which would become a useless and cumbersome idol, but with the Personal Revelation of God the Trinity, which could reach humanity with the coordinates of a Divine (and therefore precisely objective and therefore extremely stimulating) Relationality (with the possibility of keeping alive the exploratory, cognitive, personal, mysterious and driving dynamic):



By integrating the results, a New Humanity will then return to Earth with old and new treasures to make them germinate and bear fruit.

The Elastic Methodology will then belong to the scientific exploration of the Cosmic Space, offering to the “lonely man” the unique, concrete and compelling possibility of

going out of himself to enrich himself with the gift revealed by the Cosmos. In this way, humanity can discover the seriousness of its own dignity with which it can humbly return to Earth to build a renewed human adventure in the intense richness of Communion, both scientific and ethical.

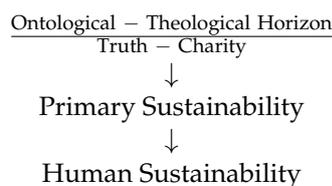
4. Discussion for Space Sustainability as an Ethical Guide for Relations

It is important to recognize that a broader approach to the exploration of outer Space must go in the direction of making us more in touch with human values (UNESCO 2003, p. 3).

Sustainability means taking responsibility for finding a common and stable rock on which we can build a solid structure of moral principles and ethical dynamics, and thus be sustained in order to ‘sustain’ an integral Progress. To do this, we need to leave our closed system to broaden our horizons (1) to have the opportunity to expand our breath and our mind humbly awakening our innate thirst for the infinite and for the truth, which otherwise runs the risk of remaining confined in narrow habits or prejudices, and (2) to seek and find a greater wisdom, to begin a richer dialogue to broaden our vision of life and the Cosmos, coming closer and closer to the mystery of the truth. Exit and return is certainly a strategy but first it is a need for completeness.

At a time when the concept of sustainability is widespread and used in a particularly pervasive manner, I feel it is necessary to question its meaning and possible foundation. The latter can be sought at the theological level, and particularly with reference to the Fatherhood of God, the Creator of the Universe. Thanks to the Personal Revelation of God in Christ, the way has indeed been opened to a new reasonable understanding of the very structure of the Cosmos created (and thus intrinsically ‘sustained’) and now intelligible through the Incarnation of the *Lógos*. Similarly, the possibility of participation in the very life of God the Trinity, in Christ, enables the development of consistent ethical, relational rather than legalistic conduct. Therefore, in order to maintain this ethical behavior, we need to search for, consider, and be aware of the sustaining “Hands” and the sustaining “style and language” that guarantee the Cosmos as a whole, which in turn is obviously given to our small hands. So, I think the first passage is to renew our attention to the level of the ontological support and transcendent meaning of the Cosmos, acknowledging it as freely given, together with the intelligent and rational life we experience. In this free gift, the language of Charity is expressed both in the gift itself and in the opportunity we have to receive and give it. This is the core of the Incarnation of God in Jesus Christ the Intelligible *Lógos*, the Word of God the Creator (according to *creatio ex nihilo* and *creatio ex Amore*) and the Sustainer of the whole Cosmos (according to *creatio continua*).

Human sustainability could therefore be a secondary rather than a primary strategy, following the understanding and the experience of the “Primary Sustainability”, being received and discovered with wonder along the language of Charity, the language of Goodness and the language of intelligibility that grasps the Truth. To be dependent in this ontological horizon, nourished by the theological reasoning that derives from the Revelation of God the Trinity in Jesus Christ the *Verbum-Lógos*, means to be free “for” a true progress towards the common good, respectful attention and conscious responsibility, where freedom becomes the possibility not only to choose, but to choose “for” the Good and the Truth, that, only, can make us free:



In this sense, Space exploration is the privileged ground onto which we can truly experience this movement: (1) from our system, (2) with our relations and cooperation (first ‘exit’ from the subject to the relations), (3) with our intelligence and rationality because of

the intelligibility of the Cosmos (second ‘exit’ from “I understand” to “We can understand”), (4) cultivating our interior thirst for the “beyond” (third ‘exit’ from physics to metaphysics and spirituality), (5) to the Cosmos and its new “Gravity” which attracts to the Infinite and transcendence (first ‘discovery’ from metaphysics to transcendence), (6) to the expansion of perception (second ‘discovery’ from technical instrument to personal plus technical plus spiritual possibilities), (7) to the evidence of a Gift through the dynamic between greatness and smallness, boundaries and mystery, knowledge and Charity (third ‘discovery’ from Science to Wisdom and to Theology), and (8) for our ‘sustained’ return back to Earth transformed as a new Humanity (first ‘growth’ at the level of Communion), as Brothers and Sisters because we have a common Father and Creator (second ‘growth’ at the level of being familiar and “born”, not self-made), and oriented towards the fullness, being opened and expanded (third ‘growth’ at the level of a Common Ethics, Responsibility and Vocation because of and towards a purpose—and towards an encounter with the Sustaining Personal and Relational God, the Trinity). With this possible and embryonic structure, the following dynamics arise:

From → With → To → For

Exit → Discovery → Growth

In this way, a solid ethical design emerges, to be developed and fully nourished along the different disciplines connected in a meaningful network of contribution, for the understanding of the same complex and offered reality. In the Christian perspective, as we have already seen, ethical experience springs from a relationship of loving dependence between God the Father and every human creature. Being sons in the Son, as a foundation, while generating meaningful relationships, drives and involves us in a renewed ethical experience. We are thus called to construct a meaningful response that aspires to the same divine Charity and Truth, that are bidirectionally, dynamically and vibrantly interwoven (*Caritas in Veritate* and *Veritas in Caritate*): «It is humankind’s purpose to shape nature in creative and responsible participation in God’s creation and with the means of culture towards increasing realization of freedom in relationship» (Losch 2005, p. 285; 2019).

I would therefore like to propose a broadening of the concept of Sustainability, adding to the ecological, economic, social and cultural dimensions (Losch 2019, p. 264) the Meta-physical/Transcendental/Spiritual/Theological dimension, as it is highlighted in the dynamic movement realized with the Space missions in which humanity as a whole is involved; following the anti-gravitational force of attraction towards the Truth that sustains us and the Cosmos, it is then possible to live a renewed experience in which our actions, relationships, research and progress are synergically interwoven. The synthesis could then be:

Primary Sustainability → Human Sustainability ⇨ Integral Sustainability

In this sense, Space Sustainability (Galli and Losch 2019), could be the opportunity to develop an Integral Sustainability as an Ethical Guide for humanity and its thirst for real and true Growth and Progress, keeping in mind the imperative of responsibility (Jonas 1985; Losch 2019, p. 264). ‘[T]he planet’s future sustainability will go wherever education and ethical thought can lead’ (UNESCO 2003, p. 6).

To return to the concept of boundaries as applied to Space exploration:

«This shows the intent of the planetary boundaries, which are designed as warning signs, including a buffer before reaching a global threshold or tipping point. ‘Humanity thus needs to become an active steward of all planetary boundaries . . . in order to avoid risk of disastrous long-term social and environmental disruption’ . . . planetary boundary approach needs to be developed further. It has also become clear that two of the boundaries, climate change and biosphere integrity, are ‘highly integrated, emergent system-level phenomena that are connected to

all of the other P[lanetary] B[oundary]s' and hence should be regarded as core planetary boundaries» (Losch 2020, p. 2).

These reflections are part of the hope offered by A. Losch who underlines how «yet we need to think bigger and develop a 'planetary plan', transcending our imaginative limits» (Losch 2020, p. 2). Indeed, we know that Space can be seen as a «driver for sustainable development» (Losch 2019, p. 260).

We can say, then, that Space Sustainability means studying, in a synergistic and extended way, the consistency of the Real in the search for a “support” in its “being”, with a consequent new ethical horizon. Space missions, in their dynamism, therefore help us to define the concept of sustainability in a more complete and meaningful way, for an organic, reasonable and cross-disciplinary reading, extended to a complete perceptual dimensionality that avoids the self-certification. As suggested by H. Jonas: «[T]he biosphere as a whole and in its parts . . . has something of a moral claim on us not only for our ulterior sake but for its own and in its own right» (Jonas 1985, p. 8; Losch 2020, p. 4), in this way we can refer to a kind of “space environment ethics” (Losch 2020, p. 5) emerging from a careful consideration of the context of Space exploration, as already highlighted by Ted Peters in 2014 with regard to “Astroethics” (Peters 2014).

The recognition of the outer Space as a real Environment, taking into account:

«“planetary protection” as more than just a question of protecting scientific integrity but part of a broader “environmental protection” regime for outer Space will strengthen the case for such measures . . . There has been a clear lack of recognition of the nature of outer Space as an environment, doing so provides a framework for understanding and protecting outer Space as an arena for human activity . . . While outer Space is undoubtedly a unique environment, it is, as discussed, within the scope of international law and therefore under the auspices of the “international community”» (Cheney et al. 2020, p. 6).

The result of these considerations is a reading of Cosmic Space that extends from the purely technical, to the environmental, and therefore to the ethical problems associated with it, but also to the relational sphere, i.e., the community dimension, which is essential for approaching this extended environment. This is a concrete example of how Space pushes towards a new epistemological experience, inducing a new way of thinking, which is still difficult to consider on Earth, but which clearly emerges from outer Space and can therefore be acquired in this context to positively influence the Earth itself. Indeed, outer Space is an “area beyond territorial jurisdiction” and is generally regarded as “*res communis omnium*” (UN 2002, pp. 3–8).

The scientific development associated with these enterprises stimulates human intelligence to progress and synergy, to develop tools and thus possibilities that stimulate and require the structuring of a moral of technology that could interpret them “for” the common good, and ultimately make them serve it.

It is precisely this broad involvement that Space research arouses at the political, social, economic, international, scientific and technological levels, but also and above all at the human level, that gives us the opportunity to recognize in Space a kind of “source of inspiration” for new humble research for the good of humanity.

In fact, the first declaration of the Outer Space Law states that the ultimate and fundamental purpose of any Space exploration is always to work for peaceful and scientific purposes, and for the benefit and in the interest of the whole of humanity. For this reason, we can find useful ideas for a moral reflection that can then also be reflected on the lifestyle of humanity on Earth, using outer Space as the “external” frontier necessary to improve life on Earth itself: «Space science and technology are now intrinsic to our daily lives and bring an abundance of unique and fundamental benefits to Earth» (COPUOS 2019, pp. 2–3).

Outer Space is recognized as a true “province of all mankind” (UN 2002, pp. 3–8), precisely because of its “enveloping”, borderless nature, and at the same time astronauts are considered as “envoys of mankind” (UN 2002, pp. 3–8), in a spatial context that in turn

urges us to be “prompted by sentiments of humanity” (UN 2002, pp. 9–12). These are not only fundamental but also programmatic foundations for the entire subsequent approach, including the present and future, to Space exploration.

The opportunity for international reflection, both political and social, offered by the unanimous recognition of outer Space as a “place” in which to “build” a new humanity on Earth, based on peace, unity and progress, is absolutely unique. Once again, Cosmic Space offers itself as a “ground” outside the Earth in which to “go out” in search of a hermeneutic completeness, another key to widen the understanding of human life. This “exit”, however, is not only functional to the impossibility of finding decisive answers while remaining closed within a system, but urges us to consciously enter a new context also for an existential completeness:

$$\text{Cosmic Space} \xrightarrow{\text{Exit}} \text{Ermeneutical Completeness} \xrightarrow{\text{Return}} \text{Earth}$$

It is about the ability to rediscover with simplicity and purity, but also with intelligence and courage, a renewed and profound vision of reality allowing ourselves to be challenged by the “song” and the “drama” of the history of the Cosmos.

The Space ventures are a privileged opportunity to awaken in the human person, even as an adult, that “being a child”, which, once the engines of the human propellant have been switched off, drives us to ignite a metaphysical and transcendental propellant which, through a further and deeper search for Truth, gives nourishment to every step of human Progress. The exit towards the Cosmos understood in this way, is indeed a true ecstasy, but at the same time it facilitates the equally necessary openness of the interiority and of the conscience, which offers the ground for a profound and personal experience:

$$\text{Humankind} \rightarrow \text{Universe} \xrightarrow{\text{Ecstasy}} \left\{ \begin{array}{l} \text{Conscience} \\ \text{Transcendence} \end{array} \right.$$

Space exploration, in all its dimensions, thus “touches” humanity at various levels, and becomes a possible Ethical Guide for Relationships based on the three main pillars revealed by this amazing frontier: (1) that of Beauty and Truth, as fundamental traits that characterize Space exploration, reminding both the astronauts and the whole of humanity of a vocation to an impellent search for our sustaining and common roots, and therefore towards the truth of God, in the discovery of the full expression of the dignity of the human person in its uniqueness and in its collectivity, and therefore in its relations and in its unity; (2) that of self-knowledge and moral conscience, that is the personal subject as a unity of freedom and responsibility, which must be founded and improved as a place of self-understanding and self-planning, as an interior, human, and personal identity in which one can understand, understanding itself, evaluate, evaluating itself, decide, deciding itself. But conscience is also creative in the sense of discerning the objective possibilities “for” the good. For this reason, conscience must be formed responsibly, in the care of a correct and objective knowledge and also in the care of one’s spiritual dimension, considering that «Conscience is the most secret core and sanctuary of a man. There he is alone with God, Whose voice echoes in his depths» (Vatican Council II 1965, n. 16); (3) that of Memory, as an important aspect of moral reflection applied to the exploration of Cosmic Space which, since the first formulation of its motivations and basic needs, has led humanity to “mark” in some way the outer Space itself with the sign of Peace and Unity. In this sense, we can refer not only to the roots of the International Outer Space Law, but also to the written plaques left on the Moon with Apollo 11 («Here men from Planet Earth first set foot upon the moon July 1969 A.D. We came in peace for all mankind») and in interstellar Space by the Voyager 1, 2 and Pioneer 10, 11 probes. The growth of moral conscience, of the human person and of humanity as a whole, on the one hand, and the imperative thrust towards the future, on the other, are important because history, and therefore memory, is a constant reason for

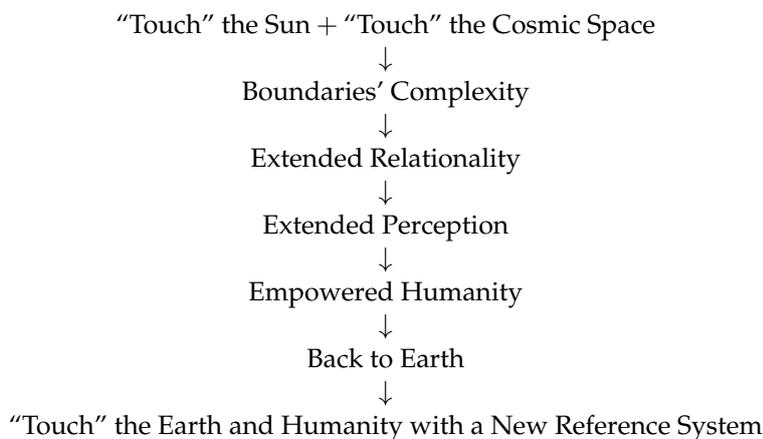
reflection and teaching so as to make real progress possible. It is the loss of memory and history that leads to presumption, mediocrity and often immorality.

Talking about Peace, Unity, Freedom, Development, Progress, in the context of Space Sustainability based on the broader Integral Sustainability, will allow us, while “touching” the Cosmic Space, to learn how to “touch” the Earth with a truly ethical awareness (Mantini 2022, pp. 423–27).

5. Conclusions

The contents of this paper are intended as a contribution to the discussion of a new scientific cross-disciplinary research method that could lead us to realize new relationships both between human persons and with the Creation. In fact, the mystery of the Cosmos is particularly evident through space exploration, which facilitates awe and humility.

We have started from space explorations, looking at the profound concept of “touching” expressed throughout the Cosmos, when human sensitivity, the first to be experienced, is combined with the richness of artificial perception which is linked to the development of technology as the fruit of humanity’s creativity and freedom in its innate search for Truth. But spiritual perception could be added to the bodily and artificial “touch”, that are typical of the technological tools, enhancing and extending human sensitivity. Space exploration, in particular, stimulates its reactivation, because, in this context, the boundaries are extended towards infinity in a complex call for “beyond”. This Complete Matrix of Perception, as this synergy has been called, has to do with the dimensions of meaning, relationality, and orientation, for valuable research that is closely linked with the important ethical problem that directly involves the human person in his explorations and in his personal and communal progress. The proposed overall framework could be the following:



The suggestion offered by the experience of “touching” the Sun allows us to reflect on this extended dimensionality, and thus, to recognize the importance of the passage, possible thanks to the widening of perspectives across internal/external horizons, towards a new sensitivity that can allow us to return back to Earth revitalized by a new treasure.

It is then possible to define an Integral Sustainability based on the awareness of a Cosmos as a Gift already and primarily sustained “for” the good, thanks also to the evidence of the complex dynamics of “touching” the untouchable. This Integral Sustainability could then consist of the recognition of the need to situate Human Sustainability on the basis of the rediscovered Primary Sustainability, which is directly related to the Revealed Theology of Creation in Jesus Christ the *Lógos*. Space Sustainability precisely helps Human Sustainability to reveal the horizon of transcendence and opens the way for ethical implications that could also be directly related to an empowered return back to Earth with a renewed Ethical and Relational Guide.

It is precisely from the discovery of our smallness (albeit great in potential) in the face of the Greatness of the Cosmos and its depths, that the human person experiences his “small power of the senses”, which he tries to extend with technology, but which

nevertheless continues to appeal to a spiritual empowerment in order to break through “the narrow fence” of his limits. This small power, finally recognized, is then projected into the development of a “virtue of the senses” that involves us in a unique human, scientific, technological, and spiritual effort that generates a truly new moral thrust on the notes of Goodness and Beauty (Pio XII 1952).

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