

## LAUDATO SI: ITS PHILOSOPHICAL FRAMEWORK

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We are holding this symposium under the inspiration of *Laudato Si*, the fundamental cosmological and environmental encyclical written by Pope Francis. This encyclical examines man's activity in, responsibility for the world. But this world is not isolated: it is part of the cosmos. In embellishing this Encyclical with a philosophical framework, we shall take a multi-disciplinary approach. Our approach will be metaphysical, cosmological and biblical. We begin with the philosophical part.

### A. Know Thyself

*Know Thyself*, Greek: γνῶθι σεαυτόν, *gnōthi seauton* and in Latin *nosce te ipsum* is one of the ancient Delphic maxims, inscribed in the forecourt of the Temple of Apollo at Delphi. This maxim was part of the communally philosophical heritages of the Greeks. Its origin is attributed to many sages, Socrates being one of them. Plato uses this Delphic maxim in at least six of his Dialogues, namely: *Charmides* (164D), *Protagoras* (343B), *Phaedrus* (229E), *Philebus* (48C), *Laws* (II.923A), *Alcibiades I* (124A, 129A, 132C).

Socrates himself elaborated it by adding: *The unexamined life is not worth living*. This is an invitation to look at that mirror which reflects the inner fabric of one's life. Failure to do so leads to a life not fully embraced. On the other hand, as Johann Wolfgang von Goethe puts it:

A man knows himself insofar as he knows the world, which he perceives only within himself, and himself only within it.<sup>1</sup>

Socrates and Goethe will constitute our point of departure for this discourse. Combining their two recommendations, we can say that no man can fully know himself unless he reflects about the cosmos in which he is situated, and of which he is a part.

Even St. Francis, the spiritual inspiration underlying *Laudato Si*, is very aware of the intimate connection between man and the cosmos. St. Francis contemplates the wisdom and generosity of God in the creatures; he sees the cosmic bodies as his brothers and sisters. He therefore invites the whole creation to join him in singing joyful praises to the God of creation. He knows that all the created things – the rolling mountains, the green pastures, the flowers in the fields,

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<sup>1</sup> Johann Wolfgang von Goethe, *Bedeutende Fördernis durch ein einziges geistreiches Wort*, cited in Karl Löwith, *From Hegel to Nietzsche*, D. Green, trans. (1964), p. 10

the animals of the forests, the moon, the sun and the stars – sing without ceasing the goodness and greatness of God.

Following in the footsteps of Francis, we undertake the beautiful journey of living the Socratic maxim of knowing ourselves by first taking a journey into and around the cosmos, that beautiful universe of which we are a part.

## **B. Cosmology: a general introduction**

### **1. The Name**

The Greek noun kosmos means “order” or “good arrangement”. The Greeks saw in this world a suitable expression for the order, beauty, and regularity which they observed in the world around them. For this reason kosmos soon came to mean “the world,” that is, the bodily universe.

The Greek word logos means word or “speech.” It has come to have the technical meaning of sustained and connected reasoning, that is, it has come to signify science.

From kosmos, the bodily world, and logos, science, we have the term cosmology. This name, therefore, by reason of its structure, means “the science of the bodily world.”

This science goes also by other names: Natural philosophy, The science of mobile being or scientia entis mobilis, that is, the science of things subject to physical and sensible movement, motion, change.

### **2. The general characteristics of Bodily Being**

Quantity: the immediate feature of bodily entities which we perceive is their extendedness. They occupy space.

Composition: all bodily entities are compounds of constituents; only the purely spiritual beings are simple.

Mutability: All material beings are subject to change, which is either substantial or accidental.

Contingency: No material being has within itself the grounds for its being. They all owe their existence to an agent exterior to them. Ultimately, however, all matter owes its existence to God, the necessary being.

Finitude. Finally, all material beings are limited in perfection. None of them exhausts within itself all the perfections in reality. Only God, the Infinite Being, has all these perfections in fullness.

### 3. The cosmos in Time

Our cosmos exists in time and space. We could say, that spacetime is that container in which we spend our entire worldly existence. Anything affected by space is also affected by time, and vice versa. Aristotle defines time as the number of movement according to before-and-after. This is a beautiful definition, but it goes beyond the scope of this presentation to elaborate it in detail.

Time is a species of “duration” and it is proper to begin our investigation into the nature of time by a brief examination of “duration”.

Duration has a close relation to existence. It is impossible to conceive the idea of “duration” without implying the idea of existence. To say that a thing exists for a minute, a day, a year, or a century, is the same as to say that it has duration of a minute, a day, a year, or a century. And an “eternal existence” is identical with an “eternal duration”.

Note: Duration and existence are altogether identical in meaning. While it is true that duration necessarily implies existence, the reverse is not true, existence need not imply duration. God could create a being in one instant and annihilate it in the next. In this case the being has had existence for one instant. But in no real sense did it have duration, because it did not endure in its existence. For duration a continued existence, no matter how short, is required. Hence, duration is defined as continued existence or the persistence of a being in existence.

Time, since it is measured in instants, seconds, minutes, hours, days, and so forth, necessarily involves the concept of continued existence or duration.

Note: We can speak of duration without in any way bringing in the concept of time.

The duration of God’s existence, for example, is termed eternity. His existence is without beginning and end, without change and sequence, without past and future. God exists of necessity, and he possesses being and activity in infinite fullness without increase or decrease in an everlasting present. God’s existence. God’s duration is an eternal now.

**Eternity**: - the complete and simultaneous possession of interminable life. It is the duration which has neither beginning nor end. Only God enjoys the duration of eternity.

**Spiritual beings**: Since they do not consist of substantial parts and form no substantial compounds, have an existence different from that of physical bodies. They have a natural existence which, though it had a beginning, has no end. Having received existence they cannot be destroyed except by annihilation. Such beings cannot suffer change in their substance, but there is succession in their states and activities. In some ways, therefore, they resemble the eternal, unchangeable existence of God and also the temporal, changing existence of physical

bodies. Their peculiar species of duration is therefore designated as “aeviternity”, they are aeviternal.

**Aeviternity**: - is the duration in existence of a creatural being which of its nature is substantially incorruptible and immortal. (It is also termed “hypothetical” “relative” or “participated” eternity.)

Due to the fact that spiritual beings undergo changes in their activities and internal states, such as thinking and willing, it is a mooted question whether their existence should not be termed temporal in character. At any rate, the concept of time may be applied to them in a wider sense.

**Physical bodies**: in a strict sense *time* applies to the duration of *physical bodies*. Our concept of time has been derived from our observation of the continued existence of bodies, due to the fact that we have an immediate awareness of our own body and other bodies in their movements and changing states. While, therefore, we do quite frequently speak of God and spiritual beings as if their existence were measured by the standards of time, this is done in a figurative and analogical sense.

#### 4. SPACE

Place and space are practically inseparable ideas and terms

Space has a wider signification than “place”; place, is, generally speaking, a portion of space. Places are in space while “space” is never spoken of being in any particular “place”. Bodies move in and through space, when they go from place to place. And by the very fact that they are in a definite “place” they occupy “space”. Space is also considered to be stationary and immobile, so that all bodies have their motion in space, while space itself does not move with the moving objects. Like “place”, space has three dimensions, length, depth and width. We speak of large and small space, wide and narrow space, empty and filled space, limited and infinite space, parts of space and all space, actual space and possible space.

In whatever way, however, when we use the terms “place” and “space” they are thought of, or rather imagined, as receptacles or containers of extended bodies. Both are thus conceived as being something distinct from the bodies, which are in them.

“Place” indicates where an object is. It therefore follows that “where” an object is, the presence of an object in a place is its whereness or ubication (Lat., ubi, where), in so far as an object is precisely in one place rather than in another. We distinguish a threefold presence of beings in a certain place: circumscriptive, definitive and repletive.

Space, as we conceive it, is the three dimensional receptacle of all extended bodies, so that the parts of these bodies are commensurate with the corresponding parts of space. We differentiate between real and ideal space.

Real space is the space occupied by existing three-dimensional bodies. Thus, the space occupied by ponderable and imponderable matter in our universe is real space. If there are other existing universes besides our own, then the space occupied by them is also “real” space. Since infinite magnitude is impossible real space is limited in extent, no matter how many universes may be. And since an actually infinite number is impossible, there can be no actually infinite number of universes in existence. The omnipotence of God can create still more universes. It follows therefore, that “real” space is capable of being increased indefinitely through the creation of new universes. Hence, more real space is possible than that which is actually filled by presently existing bodies and this “possible” space is conceived as extending without limit beyond the confines of existing universe or universes.

Possible or ideal space is thus seen to be space unoccupied but occupiable by extended bodies, in so far as more bodies could be created to fill space.

Absolute space, then, is the sum of real and possible (ideal) space considered as one. It makes no difference on our concept of “space”, whether it is occupied or not. It is simply “space” in three dimensions extending infinitely in all directions and that from eternity to eternity. Space, considered as one or a whole, is partly occupied and partly unoccupied, but all of it is “space”. Since our concepts are usually accompanied by images of the imagination, we also picture absolute space as an immense container, something like an immense box. This is imaginary space.

According to the scholastics, “space” as we conceive it, cannot be an actually existing reality, infinite in extent and eternal in duration, the receptacle of all bodies actual and possible. As such it has existence only as a concept of the mind. Yet, it is not purely a mental fiction, like a “square circle”. It is an abstraction of the mind, derived from the extension of existing bodies, with a foundation, or ground, or reason, in this very extension of bodies. Hence, “space”, as we conceive it, is a conceptual being with a foundation in physical nature.

Two interesting problems concerning the presence of bodies in place and space are those of the possibility of compenetration and replication. Ordinarily, of course, a body possesses impenetrability and unilocation: it occupies one place and one portion of space (unilocation) and hinders all other bodies from occupying the same place and space which it occupies (impenetrability). Philosophers have raised the question, whether these natural properties of physical bodies are absolutely essential to them, so that even God’s omnipotence could not remove them, or whether they are merely physical properties, so that a compenetration and replication of bodies would be possible with respect to the omnipotence of God. It would seem that compenetration and replication are metaphysical possible.

#### Compenetration:

By this we understand the presence of two or more three-dimensional or circumscriptive bodies in the same place and space. Physical or circumscriptive impenetrability of bodies implies two

things: first the actual diffusion in space of the demesne parts of a body, so that each part occupies a distinct and different part of space. Secondly, the active exclusion from this space of any other dimensive part of a body. This exclusion is brought about through a double act: the resistive power or faculty of the space-occupying body, and the resistance or exercise of this resistive faculty. The former is aptitudinal, and the latter actual, impenetrability. Compenetration therefore, would be possible at least through God's omnipotence, if the actual impenetrability could be removed by removing the "exercise" of this natural power or faculty, thereby leaving the "aptitudinal" impenetrability intact.

We must distinguish between various sorts of penetration. One thing can penetrate another through "division", as when a nail enters a board or a bullet enters a body. Also through "infiltration", as when gas or liquid passes into and through the pores of another body. Or, finally, through "compenetration", as when two or more bodies occupy identical space. We are concerned here only with this last form of penetration, because that alone is compenetration in the strict sense of the term. A compenetration of this kind is unknown to scientists. Nature presents no instances of it. So far as observation and experiment reach, all bodies possess the most rigid impenetrability. That, however, merely proves that compenetration is a physical impossibility and leaves the question of its "metaphysical" or "intrinsic" possibility or impossibility unanswered. In order that compenetration be metaphysically impossible, it would be necessary to show that its concept involves a contradiction in terms. This, we contend, cannot be demonstrated.

It would be a contradiction in terms to state that a body occupies space and does not occupy space. Or that a body is in this place and not in this place. Or a body possesses impenetrability and does not possess impenetrability. Or, two or more bodies occupy identical space and do not occupy identical space. None of these contradictory statements, however, are made, when we assume that through the omnipotence of God two or more bodies can be present in the same place and occupy the same space. The only thing necessary would be that God hinders two bodies from exercising the resistive power relative to each other. The exercise of this power is, after all, only a secondary act that follows the primary act of the power itself. Unless, then, the exercise of this power is intrinsically essential to a body as a body, compenetration should be intrinsically possible. But it is difficult to understand how or why the exercise of this power should be essential to a body as such, since bodily extension demands merely side-by-sideness or extra-position of its parts relative to one another and to the whole. Hence, it would seem that no contradiction in terms is involved in the concept of compenetration. We are, then, philosophically justified in assuming that the compenetration of bodies is intrinsically and metaphysically possible.

#### Replication:

By replication is meant the simultaneous presence of one body in more than one place, of which each place would suffice of itself to contain the entire body. If it is a question of two places for the same body, it is a case of bilocation. If more than two places, multilocation. Experience and observation show that a body is either stationary in one place or moves from one place to another, but it has never been observed that a body can be simultaneously in two places. By

means of induction, then, it is certain that replication is physically impossible. However, as in the case of compenetration, this would not necessarily establish the fact that replication is intrinsically and metaphysically possible. That point can still be argued, taking the omnipotence of God into consideration. Certainly, if replication involves a contradiction, it is intrinsically and metaphysically impossible. If, for example, a duplication of place would necessarily bring about a duplication of the body, that would be contradiction in terms. The supposition is, that one body can be in two separate places, and the actual result would be that we have, not one, but two bodies, and that is a contradiction in terms. The real difficulty of the problem consists precisely in this: can a body retain its unity of being in such a supposed bilocation or multilocation? It would seem that it could.

After this brief metaphysical examination of the fundamental dimensions of the cosmos, namely of time and space, we now examine the empirical manifestation of our universe in both space and time.

### C. THE INFINITE UNIVERSE: ASTROPHYSICAL PERSPECTIVES.

The French mathematician and philosopher Blaise Pascal wrote in his Pensées:

*"The eternal silence of these infinite spaces terrifies me"* .

#### 1. Our World in the Cosmos

We begin our journey of knowing ourselves by taking a leap into the universe: we are now exploring space. We begin with the moon. Our nearest neighbour in space is just 400,000 km away from us. On the 21 July 1969, members of the human species visited it for the first time, after a journey lasting 4 days. From the moon we go to the sun. This centre of our immediate family is 149, 600,000 km away from us. It has a diameter of 1,392, 000 km – i.e. more than three times the distance from the earth to the moon. Its weight is immense: at  $1.99 \times 10^{29}$  Tonnes, i.e. its weight is 322, 270 times that of our mother planet earth.

This beautiful sun, which sustains our life here on earth, is not as smooth as it appears to our eyes. It is an immense nuclear power plant, producing 380 billion, billion kilowatts. In a single second, it produces much more energy than the whole of humanity has consumed in its entire history. Much of its energy would be deadly for the living things here on earth, were it not for the protecting atmosphere which shields away the otherwise dangerous radiations.

This sun is the centre of our cosmological village, in which are found nine major inhabitants, namely the planets. We have nine of them: the smallest being Mercury, and the biggest Saturn. Mercury, the planet nearest to the sun, has a diameter of 4,880 km – and hence much smaller than the earth. It rotates around its axis very slowly: its complete rotation, i.e. its normal day, lasts 88 earthly days.

Jupiter, the biggest planet in our solar system, is 778 million km away from the sun. Its revolution around the sun lasts 11 Years and 317 days. It has a diameter of 142,800 km, and a weight 318 times that of the earth. It rotates around its axis every 9 Hours, 50 minutes and 30 seconds.

Pluto, the smallest planet in our solar system, is 5,910,000,000 km away from the sun, and it takes 248 years to make a single orbit around the sun.

After Pluto, we leave the frontiers of our home cosmological village, to venture to our nearest neighbouring solar system. This is the star known **Alpha Centauri**. It is at a distance of 4.3 light years from the sun. A *light-year* is a unit of length used to express astronomical distances and measures. Light, the fastest moving entity in the universe, travels 300,000 km per second. In a year light travels 9.46 trillion km ( $9.46 \times 10^{12}$  km) or 5.88 trillion miles ( $5.88 \times 10^{12}$  mi). The length of one light year is therefore 4.6 trillion years.

If humans were to travel to Alpha Centauri using the fastest rockets, they would need 500,000 years to get there. If they were to travel at the velocity of light, they would need 4.3 years. The total number of our most immediate neighbours consists of 63 stars, whose distance from our sun is within a radius of 16.3 light years. Each of these stars has its family of a planetary solar system, much like our own sun. We should recall that our sun is actually a star, and that each star we see up on the night sky is actually a sun.

Looking beyond these most immediate neighbours, we throw a glance at the galaxies.

The word galaxy comes from the Greek *galaxias* (γαλαξίας), literally "milky", a reference to the Milky Way. It is a stellar system composed of stars, stellar remnants, interstellar gas, dust and dark matter. Every galaxy is held together by gravity, having a center around which it evolves. We could compare it to the solar system, in which the nine planets evolve around the sun.

Galaxies are the ultimate clans of the universe. They are immense in size: the smallest have just a hundred million stars each, while the giants have up to 100 trillion stars each. Current studies suggest that there are at least 2 trillion galaxies in the universe. 2 ( $2 \times 10^{12}$ ) trillion galaxies, many of which have up to 100 trillion stars each. This means, the universe has more stars than all the grains of sand on the earth.

Most of the galaxies are approximately 3,000 to 300,000 light years in diameter and separated by distances on the order of millions of Light Years. For comparison, the Milky Way has a diameter of at least 100,000 LY and is separated from the Andromeda Galaxy, its nearest large neighbor, by 2.5 million LY. Another example. As per March 2016, the oldest and most distant observed galaxy was the GN-z11; it is 32 billion LY away from the earth. The spaces between the galaxies are in millions, if not billions of LY. These infinitely big spaces are empty, but not completely empty. They are filled with some gas, which is so thinly spread that one atom of it occupies an entire cubic meter.

Looking at these infinite dimensions of emptiness, we cannot but acclaim with Blaise Pascal: *The eternal silence of these infinite spaces terrifies me*” .

## 2. The milky way galaxy

Amongst all the trillions of galaxies, one of them is our sweet home. This is known as the Milky Way Galaxy. This name might sound problematic, especially since there are no cows up there in the skies. When the ancient astronomical observers looked at the night sky above their



heads, they got the impression that the shape of the group of stars was like a path, or a band, which was as bright as milk. Hence the name Milky Way.

This Milky Way, that is to say our home, is 100,000 LY across. That is to say, travelling at a speed of 300,000 km per second, or of 9.46 trillion km in a year, light needs 100,000 years to travel across the diameter of the Milky Way Galaxy. In this immensely big Galaxy are billions of stars, one of which is our home star, the sun. The spaces between the trillions of stars of our galaxy are not completely empty. In them are dust particles; in each cubic kilometer of space, there are between 25 – 50 dust particles, each of which is less than 1/1000 mm in diameter.

Within this immense galaxy, our sun is not at the center: we are actually situated at the extreme fringes of the Galaxy, at a distance of 30,000 LY from the center.

This has something to say about our anthropology. Progressive discoveries show us that nowhere are we at the center of anything. Thus, anthropocentrism gave way to heliocentrism. Our sun is in turn not at the center of the Galaxy, but rather at one of the extreme ends. Neither is our galaxy at the center of the universe: the billions of galaxies which exist in space have no geographical middle. The awareness of this fact leads us to the question, what is man in this immensity of cosmic bodies?

### **3. The movement of our galaxy**

The next question: what does our Galaxy do all the time? The answer is provided us by Heraclitus, that Greek philosopher of the late 6th century BC. Heraclitus tells us: - *panta rei*: - everything is in motion. He tells us further: “*no man ever steps in the same river twice, for it's not the same river and he's not the same man. Everything is in motion*’. Everything is constantly changing in reality; only the fact of change is permanent.

Thus even the galaxies are in constant motion, each orbiting around its center of mass. Our Milky Way Galaxy orbits at a speed of 250 km/s or 828,000 km/h. around its center. Our sun and its planets travel with it. Given the fact that our sun is 30,000 LY from the center of the Galaxy, its orbit around the Galaxy is 188,400 LY in length. That means, our sun needs 226 million years to make a single orbit around the center of the Galaxy. This further implies that since we move with our sun in her orbit around the Galaxy, we can never occupy the same position in space more than once. We need 226 million years to make one single galactic orbit. But in this time the galaxy will have moved further away, into open space, at a speed of at least 250 km/s.

The ancient Zeno said: you can never step in the same river twice. How this statement applies to our flying through the infinitely empty spaces! In space we can never occupy the same position more than once. *Panta rei*. This equally applies to time: we can never exist in the same second, or minute, or even hour, more than once. The arrow of time constantly moves from the future to the past via the present.

#### 4. Galaxies fleeing from each other

*Panta Rei*: Everything moves. The earth moves, the moon moves, the solar system moves, and the galaxies move. The entire material universe – from the smallest atoms to the biggest galaxies – is in constant motion. Becoming, changing, corruption and death are the principles governing whatever is material.

Astronomical studies have established that all the galaxies are moving away from each other and that at fast speeds: some at 68 km/s, and others even faster. Since the moment of the Big Bang – at least 13.7 Billion years ago, all the galaxies are running away from each. It is not that our galaxy were in the center, so that all other galaxies would be running away from it. The universe has no center. Our Milky Way Galaxy has no privileged position. A time will come when billions of the receding galaxies will be too far to detect, not even with the strongest telescopes. We shall then experience a cosmological loneliness: our galaxy having no more immediate neighbors. We currently have the consolation, that our nearest neighbor, the Andromeda Galaxy, is just 780,000 parsecs<sup>2</sup> (2.5 million LY) away. But for how long still? Blaise Pascal will then be even more correct: *The eternal silence of these infinite spaces terrifies me*<sup>3</sup>

A Light year: the distance light travels in one year. Light, the fastest moving entity in the universe, travels 300,000 km per second. In a year light travels 9.5 trillion km. since our nearest neighbour is 2.7 billion years away from us, the distance to that Galaxy is 9.5 trillion x 2.7 billion. That is a short astronomical distance.

#### 5. The origin of the universe

If the galaxies are constantly moving apart from each other, it follows that at some time in history they were much closer to each other. The current theory states that the origin of the universe, the moment of singularity, was a very big explosion known as the Big Bang. What exploded was the totality of matter then present, most likely condensed in a single entity, if not a single point. That was the moment of singularity, at which even space and time had their beginning. Theologians generally accept this theory, immediately adding that God created that which originally exploded.

There are other cosmogonic theorists, among whom is the famous Steven Hawking, who died last year, who are of the view that God is not needed in the equation of the origin of the universe. Once God is bracketed out, then you have a finite entity, which has no beginning. This clearly violates the 4<sup>th</sup> supreme principle of metaphysics, which states whatever is has an adequate reason to account for its coming to be. Since the universe is not a necessary entity,

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<sup>2</sup> Astronomical distances are also measured in parsecs, or even mega parsecs. One parsec is equal to about 3.26 light-years (30 trillion km)

it follows that it must have a beginning, and hence a cause. An alternative view would be violating the fundamental principle of non-contradiction.

Going back to the theory of the Big Bang, studies have shown that this must have taken place about 13.5 Billion years ago. This then is the age of the universe, and all the trillions of galaxies, with their trillions of stars each, fall within this age-bracket. Our sun and the entire solar system emerged almost 9 Billion years after the Big Bang. That means, that our solar system is now 5 Billion years old, one of the youthful heavenly systems.

## **6. The end of the stars**

The life of stars can be compared to that of human beings. The stars have their moments of birth, growth, youth, old age, and finally death. Everything is under constant change. Let us take the case of our sun, which is actually an average star. Although it appears to our eyes as being the same beautiful sun every day, the reality is much different.

Within the course of a single day, the sun acts like a gigantic nuclear power plant: at its centre, immense quantities of hydrogen are being transformed into helium. As a result, much material is thereby being transformed into energy. Part of that energy is the light and warmth which we enjoy every day. The price the sun pays for this: each day it loses 370 billion tonnes of its weight!

What happens to the sun applies equally to all the stars, even though they appear to us to be the same shining stars of the day before. However, each of them loses billions of tonnes every day. Some stars lose weight which is much bigger than the weight of our entire planet earth. They lose it through the burning of hydrogen into helium, or through other atomic reactions. The centres of the stars are consequently very hot: ranging from 16 to 30 million degrees Celsius.

With time, however, much of the interior hydrogen will have been turned into helium. That commences the period of aging, or of degeneration. Once all the hydrogen has been so burnt, the interior thermonuclear reactions stop, and with that even the production of energy. But due to a series of other chemical transformations, the star begins to increase in volume. It becomes a gigantic red star. That is the sickness of old age. It lasts on the average 150 million years. The final sigh of life in a star is an immense explosion, which comes about because the centre of the star can no longer hold the mass together. Due to the immense light produced, ancient astronomers referred to it as the supernova. But we now know that it is the final act in the long life of a star.

Coming back home, our own star, the sun, is now middle-aged: it is about 5 billion years old. It still has an existence of a further 5 billion years: only then will all its interior hydrogen have been turned into helium, and the helium into iron. Like other stars of its size, the period of old age illness will last 150 million years. During this period, about 4.5 billion years from today, the sun will have become so big that it will have swallowed up our beautiful planet earth. Prior to this swallowing, the increased immense heat produced by the sun will have burnt and destroyed all forms of life on earth. Not a single drop of water will remain: even all the oceans will evaporate.

After about 5 billion years from today, the final day of our sun will come: it will make an immense gigantic explosion, whose light will be more brilliant than the sun has ever been. That will be the end of our solar system; but the other trillions of stars in the trillions of galaxies

will continue to exist. The rest of the universe will be indifferent to the death of our sun and solar system just as Ugandans are indifferent to the death of a small mosquito in the Brazilian Amazon forest.

## 7. The earth, the planet of life

The planets of our solar system, including our earth, were formed about 4.6 billion years ago. Our moon was formed about 100 million years later. About 3.5 billion years ago, the oceans emerged, and that opened the way for the emergency of life. Some of the most ancient traces of early life are 2.2 billion years old, found in the Transvaal province of South Africa. The first animals emerged between 700 – 600 million years ago. We shall not go into the details of the possible evolution of life. Instead, we go straight to the human race. The *Homo erectus* emerged about 350,000 years ago, while the contemporary *Homo sapiens* emerged about 50,000 years ago.

According to the current stand of studies, only this small dust particle known as earth has the monopoly of the cream of creation, namely life. It is not yet known whether other planets, amongst the trillions outside there, have forms of life or not. Whatever the case may be, our planet, though insignificantly tiny, is home to a rare gift of nature, namely life. This makes all forms of life so precious that it should be the duty of every rational human being to protect and preserve life in all its manifestations.

### D. MAN IN THE UNIVERSE

After seeing the dimensions of space and time, and after seeing that the human person can fully know himself with the additional knowledge of the universe, we now divert our attention to the lived experience of man in the universe.

As Heidegger puts it, man encounters himself as a ‘Thrown’ into existence. *Omuntu ky’e kiramu ekizuula nti kinyugunye mu kubaawo. Alina okuzuula amakulu g’obukanyuge buno:* man has to work out the meaning of his thrownness into the cosmos.

We get a first answer from the Bible. Already in Genesis God tells man:

*‘With sweat on your brow shall you eat your bread,  
Until you return to the soil as you were taken from it’. (Gen. 3/19)*

This marks the biblical beginning of *Homo faber*. From then onwards, all people must work in order to survive in that part of the universe that they call home. While carrying out this necessary working, however, man must never be destructive, his role must be that of a guardian. If through over-exploitation of the environment in an over-zealous effecting of Francis Bacon’s admonition that man must dominate nature - the earth ceases to be home to life, man will have brought to any most forms of life of the planet earth. Millions of organic species have already been made extinct as a direct consequence of human activity.

It is a must to live as *Homo Faber* in this world, but this should never be at the expense of life conditions.

Secondly, man is not only *homo faber*: he is also *homo sapiens*! Created in the image of God (Gen. 1/27), he has a participation in the spiritual - intellectual life of God. Man's intellect enables him to master the environment. He transcends the immediate conditionalities of his environment, thus making nature his servant. And nature is a very obedient servant – *obutonde muddu awulira*. But only to some extent. If man ignores the limits, nature will strike back, oftentimes without mercy.

The *homo sapiens* has produced many works of civilisation over the course of the millennia. But we shouldn't forget: the *homo sapiens* who plants trees, is the same agent who fosters desertification through deforestation. The *homo sapiens* who makes tractors, is the same subject who manufactures atomic bombs. It is all a question of choice: human beings can use their intellect either to protect and preserve the world, or to destroy it.

A third mode of human existing in the world is that of being *homo contemplator*. This is man who contemplates, observes and takes note; he knows that besides the necessary working, moments of contemplative admiration of the stars and of embracing the mountains are equally vital. The *homo contemplator* reflects not only about the cosmos, but also about himself. Here man is bent, not over the fields to cultivate them, but over himself, turning himself into a question mark. His question has been asked by all humans since the emergence of the *homo sapiens*: what is man?

Psalms 8 is one of the best cosmological psalms written by the *homo contemplator*:

*I look up at your heavens,(read galaxies) made by your fingers,  
At the moon and stars you set in place –  
Ah, what is man that you should care for him?*

*Yet you have made him little less than a god,  
You have crowned him with glory and splendour,  
Made him lord over the work of your hands,  
Set all things under his feet.*

Contemplating the majesty of God's creation leads man to the important question: what is man amidst this extravagant abundance of God's cosmos? The admiration leads to humility: what is man, inhabiting a planet that is like a particle of dust amidst the trillions of trillions of galaxies and stars? What is man, that God bends over to think of him, and even to make him little less than the angels? The infinitely majestic God thinking about the product of dust.

The wise king Solomon had the insight to say: '*The heavens and their own heavens cannot contain you*' (1 Kg 7/27). In our biblical cosmology, this means: even the sum total of the immensely big trillions of galaxies cannot contain God!

On the other hand, although the entire universe is full of God's glory, God remains hidden. '*Truly, you are a hidden God*', we read in Isaiah 45/15. The *homo contemplator* will soon realise, that this God is everywhere, but nowhere to be seen. He is an absent God. Why does God hide himself? This reality has a history.

In the Garden of Eden, just after Adam and Eve had eaten of the forbidden fruit, it was God who came searching, looking for Adam.

*'Yahweh God called to the man: Where are you? ..... Adam replied: I heard the sound of you in the garden, ... so I hid'. (Gen. 3/9f).*

Adam was thus the first to hide himself from God

However, ever since this incident in Genesis, it is God who hides himself. He is a master of the hide and seek game, *jjangu onkwekule*.

But the homo contemplator doesn't despair; he realises that though God is hidden, the entire cosmos is an open book about the Creator. Psalm 19/2-5 proclaims:

*The heavens (i.e. the galaxies) declare the glory of God,  
The vault of heaven proclaims his handiwork,  
Day discourses of it to day,  
Night to night hands on the knowledge.*

*No utterance at all, no speech,  
No sound that anyone can hear,  
Yet their voice goes out through all the earth,  
And their message to the ends of the world.*

To anyone who has eyes that see, and a heart that contemplates, nature is full of the glory of God. He can listen to that language of nature that is without speech. This nature has an extra message to man, she tells him:

*Pay attention: do you see the nature, a sign of God, a reflection of the glory of God? Even you ought to be God's glory. Do you live up to this task?*

*Homo contemplator* will further discover that in Psalm 19, the cosmos is telling him that if at all there is disorder, or chaos in the universe, it is due to the sin of man.

Finally, Psalm 104, a cosmological prayer which sings of the praises of God's extravagant, majestic creation, ends with a practical petition:

*'May sinners vanish from the earth, and the wicked exist no more' (Ps. 104/35).*

Isn't it possible that the psalmist was here talking about environmental sinners the destroyers of ecological systems?

After the homo contemplator, we end with an examination of *homo liturgicus*.

What do we see here? The homo contemplator bends over the universe, in search of God in the creation, and in search of the meaning of his life. The homo *liturgicus* now stands up, taking the entire universe in his hands, to offer it as an oblation to God. This homo liturgicus must first adore God in the universe. He must embrace the infinitesimal, and adore the immensely big. This is neither idolatry nor pantheism. But it is paying homage to that God whose glory the stars of heaven proclaim.

The homo liturgicus will perceive the whole universe as sacred, because it is the work of God's hands. Whatever we conceive to be sacred, should be accordingly revered.

St. Francis canticle of the creatures, which forms the spiritual stratum of Laudato Si, was in turn inspired by the cosmological prayer of Daniel. We always recite this prayer in the Morning Prayer of the first week of the Psalter. I remind you briefly how we pray it:

O you works of the Lord, O bless the Lord.  
To him be the highest glory and praise forever.  
And you, angels of the Lord, O bless the Lord,  
To him be the highest glory and praise forever.

And you, heavens of the Lord, O bless the Lord,  
And you, clouds of the sky, O bless the Lord.  
And you, all armies of the Lord, O bless the Lord.  
To him be the highest glory and praise forever.

And you, sun and moon, O bless the Lord.  
And you, the stars of the heavens, O bless the Lord.  
And you showers and rain, O bless the Lord.  
To him be the highest glory and praise forever.

O let the earth bless the Lord,  
To him be the highest glory and praise forever.

And you, mountains and hills, O bless the Lord.  
And you, creatures of the sea, O bless the Lord.  
And you, every bird in the sky, O bless the Lord.  
And you, wild beasts and tame, O bless the Lord.  
To him be the highest glory and praise forever.

And you, children of men, O bless the Lord.  
To him be the highest glory and praise forever.  
And you priests of the Lord, O bless the Lord.  
And you, servants of the Lord, O bless the Lord.  
To him be the highest glory and praise forever.

A very beautiful prayer. Whenever we recite this cosmological prayer of Daniel, we are executing our role as *homini liturgici*: the priests of creation, calling all creatures to praise the Lord.

## CONCLUSION

After this brief survey of the cosmos, of space and time, and of man's place in the universe, we conclude by saying that in order for man to be able to live successfully in the world, he must be both homo faber and homo sapiens. But if he is to harmoniously co-exist with creation, as a guardian and protector of nature, he must necessarily be homo contemplator and homo liturgicus.. These two dispositions are not practical at all, but their implementation yields highly practical results for the protection of creation.

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