

Physical Cosmology and Christian Theology of Creation

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Abstract

Why investigate, from a scholarly point of view, the relationship between Physical Cosmology and Theology of Creation? The issue is relevant for theology: if the world, as object of the natural sciences, is the same and unique world created by God through his Word-Logos, then theologians should be interested in scientific knowledge of the cosmos. On the other hand, if scientists are truly engaged in investigating the reason for why the physical cosmos is the way it is, they should also show some interest to know the rational, philosophical content of the Logos, whom theology claims to be the ultimate reason of all that exists. However, to compare scientific and theological perspectives on the physical cosmos, some necessary clarifications are needed. These clarifications concern how to approach, at different epistemological levels, notions such as “origins”, “universe”, “cause”, “being”, “nothing”, etc. Moreover, insofar as it tries to embrace the whole of physical reality as a single intelligible object, physical cosmology necessarily assumes some implicit philosophical framework, that also deserves to be clarified and made explicit. Theologians, however, should not confine themselves

offering epistemological clarifications to scientists; they should also appreciate cosmology's attempt to approach ultimate questions. In fact, although the empirical method remains incapable of giving an exhaustive answer to these paramount questions, cosmologists will always continue to face them, as the Universe is the effect of Creator's Word, who calls and appeals. Listening to theologians speaking of a divine creation should turn cosmologists' attention to the properties of a *created* world. The effect of an intelligent Logos and a personal Creator, a created world is expected to be rational, intelligible and ordered. The behavior of physical entities, in identical boundary conditions, is expected to be lawful, not capricious, and the properties of elementary particles to be strictly identical on cosmic scales. Within a created world, information is recognized to be as original as space-time or matter-energy. For both scientists and theologians, the universe is something "given". The very meaning of data (*datum*) in science, is givenness; according to Christian theology of creation, the ultimate reason of the world is being the Creator's gift.

Introduction

Within their specific method, the relationship between scientific cosmology and theology of creation should concern the whole of physical reality. However, there are two special issues which deserve to be investigated more in depth: the question of the *origins* and the debate on the meaning of man's place in the cosmos. Certainly many more borderline scientific questions have implications on several theological domains, but the ultimate questions regarding the origin of the universe, and about the role, meaning and destiny of human life in it, have always exercised particular fascination. They give rise to profoundly existential questions that are, at once, philosophical and religious. The appeal that these questions exert on the general audience is testified by the growing space they occupy in today's works of scientific popularization. As we can easily verify by browsing the "new books" section of any large bookshop, headings such as "the origin of the universe," "the origins of life," and "the

origins of human beings” have become commonplace in the titles of this literary genre. By the same token — often in titles themselves — references to the word *God* have also become frequent, almost as a demonstration that such “ultimate questions” cannot but involve religion. Each religious tradition — here I will deal with the Judaeo-Christian Revelation — has a doctrine on the origins of the world and human beings, the expression of a millenary conveyance of contents that we indeed call “histories of the origins.” Questions on the comparison between the views derived from the biblical Revelation and the reading formulated by the natural sciences thus emerge; for these two readings to be compared, however, a few epistemological clarifications are necessary.

Theology of Creation and Quest on the Origins

A too easy expedient to make the “revelation on the origins” received from the biblical Revelation immediately compatible with the scientific reading of the events relating to the evolution of the universe and the emergence of life could be to highlight the “mythical” element of great part of the biblical accounts. Here I am not using the term myth in the sense of archaic knowledge, conveyed and mediated through important narrative and cultural categories, as outlined for instance by authors such as Paul Ricoeur. Rather, I plainly refer to the idea of fantastic, mythological popular tales, from which we do not need to draw a stable and coherent “truthful” content. If this is the case, then the sciences do not provoke, nor are they provoked by, the biblical message because the latter, whose content is essentially allegorical, would mainly have a subjective-existential value. The accounts narrating the creation of the universe and the progressive formation of the sky and the earth; the creation of the first human couple and the revelation of their original intimacy with God; the subsequent experience of sin; the dramatic events linked to the Flood and the consequent covenant

with Noah; Abraham's and the other patriarchs' calling; in sum, all the most ancient events in the history of salvation, would have no correspondence with the history actually experienced by the *Homo sapiens* on our planet.

In order to correctly understand what the biblical Revelation wants to tell us about the *origins*, about the original and originating relationships between God and humankind, God and nature, we cannot limit ourselves to the first chapters of the Book of Genesis, especially if these are considered in a fragmentary and strictly literal sense. Those verses —while solemn — do not exhaust the meaning of those relationships, nor do they contain the whole of the biblical doctrine of creation that, instead, can also be found in the prophetic and sapiential books, and in their interpretation by the Fathers of the Church. In addition, a genuine knowledge of the grounding relationships between God, human beings and the world cannot set aside the mystery of the Word Incarnate as revealed in the New Testament, nor can it ignore the eschatological announcement of that “new creation” whose firstfruits are already contained in Jesus Christ's resurrection. When, in a few specific cases, the Catholic Church's Magisterium called for the recognition of the “historical” value of some biblical accounts, it does not imply that each individual fact described in the Bible exactly occurred in the way it is detailed, but simply that what the Bible recounts has its ultimate grounding in history, in words and works that God has said or done, and that the writer expressed this with the language that was culturally available at the time. In this sense, we can now recuperate a positive interpretation of the term “myth,” which biblical exegesis can easily refer to when it understands the allegorical meaning not as a baseless fairy tale (*mythos*), but as a narration that conveys foundational knowledge, which ultimately rests on a real truth content that the sacred author wanted to transmit. This interpretation avoids the risk of limiting exegesis to a closed hermeneutic circle, where the continuous referral to symbols and images ends up

saying nothing, because these remain unable to refer to anything beyond themselves.

With these necessary premises in mind, I will now try to summarize some historical facts as offered by the natural sciences. However, a previous clarification must be made. In the physical sciences and cosmology, the scientific description that tries to reconstruct the various steps taken by the material universe in the past (the term “material” is intended here in a broad sense, thus including energy, physical laws, space-time, metrics, topology, etc.) is not equivalent to “give the reason of the origin,” nor does it coincide with an “explanation of the origins,” if we give the term “origin” a strong causal sense. The origins of the being of things, of their essence and existence — that is, the ultimate and founding reasons for which the universe exists, and it has the qualities it has and not others — implies a causal relationship that transcends the scientific method. The starting point in each empirical analysis is represented by the effects of this causal relationship (the real world and its properties). We must always start from something “given,” be that the metrics of space-time, matter and energy, or the laws of nature, including quantum laws able to represent the extraction of energy from the geometry of the quantum void. Trying to identify further grounding reasons is the object of the philosophy of nature and of metaphysics, no longer of physics, because in this search we enter a typical ontological domain. We could show that this ontological transcendence, like an inescapable “gap”, also exists in those cosmologies that, in order to describe the origins of all things, resort to quantum fluctuation models of our universe, or introduce a plurality of independent space-time regions (multiverse).¹

1 Cf Evandro Agazzi, “The Universe as a Scientific and Philosophical Problem”, in Evandro Agazzi and Alberto Cordero, eds., *Philosophy and the Origin and Evolution of the Universe*, (Dordrecht: Kluwer, 1991), pp. 1-51; Robert John Russell, “Finite Creation without a Beginning: the Doctrine of Creation in Relation to Big Bang and Quantum Cosmologies”, in Robert John Russell, Nancey Murphy and Christopher Isham, eds., *Quantum Cosmology and the Laws of Nature* (Vatican City State: Vatican Observatory Publications and The Center for Theology and Natural Sciences,

Paul Davies well outlines this state of things: “However successful our scientific explanations may be, they always have certain starting assumptions built in. For example, an explanation of some phenomenon in terms of physics presupposes the validity of the laws of physics, which are taken as given. But one can ask where these laws come from in the first place. One could even question the origin of the logic upon which all scientific reasoning is founded. Sooner or later we all have to accept something as given, whether it is God, or logic, or a set of laws, or some other foundation for existence. Thus ‘ultimate’ questions will always lie beyond the scope of empirical science as it is usually defined.”² A similar remark was made roughly a century earlier by James Clerk Maxwell, who observed that “Science is incompetent to reason upon the creation of matter itself out of nothing. We have reached the utmost limit of our thinking faculties when we have admitted that because matter cannot be eternal and self-existent, it must have been created. It is only when we contemplate, not matter in itself, but the form in which it actually exists, that our mind finds something on which it can lay hold. That matter as such should have certain fundamental properties—that it should exist in space and be capable of motion, that its motion should be persistent, and so on, are truths which may, for anything we know, be of the kind which metaphysicians call necessary. We may use our knowledge of such truths for purposes of deduction, but we have no data for speculating as to their origin.”³ Maxwell’s emphasis on matter depends on the worldview he was familiar with at his time: today we would speak of space-time metrics, quantum vacuum, or other physical entities, but the logic of the discourse would remain the same.

1993), pp. 293–329; Joseph Zycinski, “Metaphysics and Epistemology in Stephen Hawking’s Theory of the Creation of the Universe”, *Zygon* 31 (1996): 269–284.

2 Paul Charles William Davies, *The Mind of God. Science and the Search for Ultimate Meaning* (London: Simon & Schuster, 1992), p. 15.

3 William Davidson Niven, ed., *The Scientific Papers of James Clerk Maxwell* (New York: Dover, 1965), v. II. pp. 376–377.

If we consider the question of the origins of the universe in its weakest sense, for example, as a simple “beginning of time,” the scientific description would not be able to render a philosophically complete account of such a beginning. As Thomas Aquinas already demonstrated centuries ago — and St. Augustine before him — time cannot be the measure of its own origin, nor can it measure the shift from non-being to being,⁴ since creation is neither a motion nor a change, but mainly a relationship: “Creation places something in the thing created according to relation only; because what is created is not made by movement, or by change. [...] Creation in the creature is only a certain relation to the Creator as to the principle of its being.”⁵ To the above reflections I should add that an exhaustive description of physical reality, sought within the scientific-experimental method, would always have to deal with the “philosophical problem of the whole:” only philosophy, ontology and metaphysics in particular, can conceptualize the whole because, at the level of scientific causes, we can never know with certainty the role of the part in the whole, as we are dealing with an unlimited object, able to lead to further and further questions.

What has been said so far is sufficient to clarify that, in the physical-cosmological domain, the answers provided by science are not answers to the *ultimate questions* or to the *questions on the origin* intended *stricto sensu*, as the origin of the whole. Nevertheless, it is legitimate for these questions to emerge in the scientists’ work, and in some ways it is also to be expected. As human beings — and perhaps more so than others, because of their capacity to embrace, with their gaze, the entire evolutionary history of our universe — scientists cannot but wonder about the ultimate causes of reality and feel strongly drawn to them. The answers given by Judaeo-Christian

4 “Things are said to be created in the beginning of time, not as if the beginning of time were a measure of creation, but because together with time heaven and earth were created. [...] And creation is neither movement nor the term of movement.”, Thomas Aquinas, *Summa Theologiae*, I, q. 46, a. 3, ad 1^{um} and ad 2^{um}.

5 *Ibid.*, q. 45, a. 3; *Contra Gentiles*, Book II, ch. 18; *De Potentia*, q. 3, a. 3.

Revelation, when explaining the ultimate reason of the existence of the universe cannot, then, conflict with the enquiry of the natural sciences, and this is the case for two reasons. From the philosophical point of view, this is so because the revealed image of God, which attained its fullness in Jesus Christ, is that of the primary Cause of being, and of the being of all things, a Cause of which the natural sciences cannot claim any critical knowledge. From a more strictly theological point of view, this is because the kind of answers provided by Revelation regard the existential domain, since these try to explain who human beings are before God, what role they have in the universe, and how the created world entirely depends on God. These strict theological answers attain their fulfilment in the New Testament, where it is shown that creation itself is part of a redeeming covenant centered on Christ's cosmic headship, and that his glorious resurrection provides the ultimate key for understanding the future of also the material universe. As can be easily observed, all these answers go far beyond the reach of scientific method. The difference in the answers given by science and theology to the cosmological problem do not, however, entail extraneousness or independence. God is the creator of the same physical world that the scientist analyzes, and this is the reason why the latter is drawn to the existential relevance of the ultimate questions raised by the universe. At the same time, the scientific description of the universe and of its evolution rules out any theological model where the relationship between God and nature are interpreted in a way that the Creator's role loses its transcendence and exerts a causality competing with the physical causes that science is called to explain.

Theology of Creation and the Origin of Life

If we now turn to the biological sciences and consider the question of the "origins" of life, the same ontological shortcomings characteristic of any scientific enquiry operating at the empirical

level are found in the scientific analysis of life, at least in those aspects that depend on that level. But when we deal with life, this inadequacy is manifested in an even more radical way, because of the higher level of complexity that is implied and of its irreducibility to matter⁶. This does not mean that life is not a proper object of study for science, but simply that the method to be used can no longer be that of traditional methodological reductionism, based on composition-recomposition or on the principle that the whole is equivalent to the sum of its parts. Once all the component parts of a living being are analyzed and separated from each other, we cannot recover the same living being any more. At the same time, recognizing that deterministic mechanism is not an adequate approach to the phenomenon of life does not force the scientist to accept any vitalistic view that sees in teleonomy and self-organization processes, typical of living entities, the action of extrinsic causes or of some intelligent plan at work from outside. Reasoning in this way is no longer possible within the domain of the sciences but only in that of the philosophy of nature. In fact, both reductionism and vitalism are strategies that lie outside an empirically rigorous approach to the sciences of life.

An aspect of the emergence of the phenomenon of life over matter could be, as far as we know today, the impossibility to reproduce biological life in a laboratory, starting from the elements that make it up. Precisely the question of the origin of life on earth and research on its possible artificial synthesis — even due to its resonance in scientific popularization — represents one of the classical themes of debate between scientific and philosophical-theological thought. The idea that if this research were successful then science alone, and not other sources of knowledge, would own the ultimate key to the mystery of life is indeed very common. In reality, it makes sense to recall that up to the end of the 18th century, the argument of

⁶ Cf Michael Polanyi, "Life's Irreducible Structure", in Marjorie Grene, ed., *Being and Knowing*, (London: Routledge & Kegan Paul, 1969), pp. 225-239.

“spontaneous germination”, which stated that life could be generated both through the seed of one’s own species, and through the transformation of organic material in a state of decomposition, was commonly accepted by all, including those who believed in God as Creator. The argument that life could appear from inert matter thanks to the action of sun energy and heat — as believed since ancient times — did not seem to raise particular problems even for Christian theology at the the time of Thomas Aquinas⁷. In today’s science, the question on the origin of life is still open, the same way that the question on the actual spread of life in the universe still has no answer, even if, in the scientific domain, optimistic arguments prevail in this regard⁸. Both laboratory research and the analysis of cosmic matter, as well as indirect observations of the chemistry involved, have, so far, led to the identification of only some of the essential components of life, without reaching the synthesis of any living organism or the discovery of any form of life beyond earth. Several aminoacids and several macro-molecules have been synthesized and the RNA synthesis has also been obtained; the latter’s capacity to replicate in the presence of catalysts and adequate environmental conditions has been observed, but these are organic compounds, whose phenomenology is still quite different from that of a self-replicating living entity. The same could be said of the organic material found in meteorites that have landed on the earth’s surface or on other celestial bodies orbiting around the sun.

As relates to these issues, theology would seem provoked in many respects, usually relating to the comparison between the views of life in the Holy Scriptures and the results of the sciences. Concerning the latter, we could mention the long time that was necessary for life to appear on earth; the elements that progressively caused the increased complexity and the (sometimes dramatic) end and

7 Cf Thomas Aquinas, *Summa Theologiae*, I, q. 71. a. un. ad 1^{um}; q. 73, a. 1, ad 3^{um}; q. 105, a. 1, ad 1^{um}. Cf also *In XII Libris Metaphysicorum*, Book VII, lect. 6, nn. 1399-1403.

8 Cf Christian de Duve, *Vital Dust. Life as a Cosmic Imperative* (New York: Basic Books, 1995).

rise of many biological species; the continuity between other animal species and the human species. More generally, think of the relationship between creation and evolution. I believe that all these different questions lead to a fundamental issue: theology is called on to explain in what way, and in what respect, life is a privileged bearer of God's *mark*. Life indeed seems to belong first and foremost to God, as something proper to Him; He who is presented by the Bible as "the Living" and "He who loves life" (cf *Dt* 5:26; *Ps* 84:3; *Jb* 34:14-15; *Wis* 11:24-26; *Jer* 10,10). It is thanks to God's active and living spirit that "man became a living being." (*Gn* 2:7). In this sense, the biblical Revelation presents life as the result of a precise creating intention. Life on the earth is not the output of chance or of random circumstances, but it is wanted by the Creator according to a progressive ascending movement, that seems to point towards the human being, as someone "capable of God," because created in God's own image and likeness.

In reality, the empirical sciences do not have the methodological bases to support the thesis that the origin of life is a fortuitous result, an epiphenomenon in the framework of a boundless universe whose meaning and destiny — as argued by Jacques Monod or Stephen Weinberg⁹ — would be written nowhere, a thesis which looks much more philosophical than scientific in character. Therefore, a theology of creation that, based on the Revelation, states that the "origin" of life pursues a goal, has its ultimate cause in God the

9 "Man at last knows that he is alone in the unfeeling immensity of the universe, out of which he emerged only by chance. Neither his destiny nor his duty have been written down. The kingdom above or the darkness below: it is for him to choose.", Jacques Monod, *Chance and necessity* (London: Fontana, 1972), p. 167. "The more the universe seems comprehensible, the more it seems pointless [...]. But if there is no solace in the fruits of our research, there is at least some consolation in the research itself. [...] The effort to understand the universe is one of the very few things that lifts human life a little above the level of farce, and gives it some of the grace of tragedy." Steven Weinberg, *The First Three Minutes* (New York: Basic Books, 1977), p. 154.

Creator, in His will to give, to share something that belongs to Him, does not contradict any scientific conclusion.

Let us now turn again, and more in depth, to the reasons why a “scientific” affirmation of an absolutely accidental view of life, or the negation of any creating intention for its origin, are untenable. If science asserted the randomness of life, it would actually be formulating a philosophical interpretation of life itself, an understanding that would be idealistic (if not ideological), because unsupported by factual verification. Even if science could know and retrace all the stages of the pre-biotic development on our planet, or if one day our attempts to reproduce it in a laboratory were successful, we would still not be obliged to see life as the result of chance or as something entirely reducible to matter (in the most “materialistic” sense of the word). We should indeed recognize three different levels to approach the cause of life: scientific, philosophical and theological, each of which answers different questions. What happens at the level of efficient causality — whether physical or biological — can be “transcended” by a more general and a more metaphysically grounded level of understanding. The presence of a final causality at the philosophical level (that, still at the philosophical level, would be in contrast with the idea of chance as the “ultimate reason” of explanation) or the presence of a creating intentionality at the theological level, do not conflict with any scientific analysis. Nor does their acknowledgement entail presuming the action of “hidden” causes, because a final (in a strong sense, intentional) causality does not operate in conflict with biochemical or biological processes.

I am persuaded that when scientific thought — in both the cosmological and the biological domains — presents exhaustive and totalizing views, which strive to answer the “ultimate questions,” the scientific language implicitly shifts towards the language of myth, unwittingly using some of its archetypes and ending up proposing its “own account” of history. A careful reading of several works of scientific popularization, or the analysis of terms frequently used

therein (the universe *before* the Big Bang, the theory of everything, the cosmic soup, the life of the cosmos, etc.), would be sufficient to highlight this peculiar, somewhat unavoidable process. It is at this level that seeming conflicts with the content of the biblical Revelation may emerge. These occur at a level that no longer relates to the comparison between theology of creation and scientific data, but to the relationship between theology and the philosophical mediation that presents, interprets and organizes scientific data. Such mediation may draw from a realism open to being continuously ruled by observation or, more dangerously, from an idealism that has relinquished the connection with experience and is content with its internal coherence and self-referential grounding. In this sense, if the Revelation and theology justify their resorting to all-encompassing answers —and to the myths that could express at times their language — on the basis of a divine Word which is received and accepted by a believing community, the empirical sciences can justify their all-inclusive and far-reaching answers only based on the scientist's own ideal view, or on the philosophical climate from which he or she unwittingly draws the categories necessary to represent his or her worldview.

We should recognize that, on the issue of the *Origins*, biblical Revelation and theology answer a higher and more fundamental type of question, which partly exceeds even what philosophy can thematize. Revelation's answers regarding ultimate meaning concern the beginning and end of history, the beginning and end of all things, the First and the Last, which cannot be known through a rational elaboration internal to history, but only by listening to the Word of the One who transcends history. Moreover, Revelation answers questions that deeply relate to the individual. Even if science and history could reconstruct all the stages of the cosmic evolution that have led from the Big Bang and, later, from the primordial beginning of life up to the appearance of human beings — including all the steps that determined our biological and psychological features

— the causal chain so obtained would still fail to answer the most important question: *why am I here?* It is this sound insight that Blaise Pascal experienced when he stated: “I do not know who put me into the world, or what the world is, or what I am. I am in a terrible ignorance of everything. I do not know what my body is, or my senses, or my soul, or even that part of me which thinks what I am saying, which reflects on everything and on itself, and knows itself no better than anything else. I see those fearful expanses of the Universe which hedge me in, and I find myself fixed in one corner of this vast space, without knowing why I am placed here rather than elsewhere, or why the little time that is given me for my life is assigned to this point rather than another of the whole eternity that was before me and will be after me... All that I know is that I must soon die, but what I know least is this very death which I cannot escape.”¹⁰ The natural sciences investigate the phenomena of life and death, and philosophy wonders about the existential weight they carry, but only the faith in the Word of the Revelation can receive the truly “ultimate” answer to the meaning of it all: “Before I formed you in the womb I knew you, before you were born I dedicated you” (*Jer* 1:5), because “in him [Christ] he chose us, before the foundation of the world, to be holy and without blemish before him. In love he destined us for adoption to himself through Jesus Christ.” (*Eph* 1:4-5).

Distinguishing among these different levels of causality and finality is useful also when we are asked to evaluate philosophical, and even theological consequences associated with the so-called Anthropic Principle. By this Principle contemporary cosmology indicates a number of delicate physico-chemical conditions which mainly originated in the the very early universe (numerical value of natural constants, properties of fundamental particles, etc.), which later allowed the formation of one or more *habitat* adequate for life (that is, proper abundances of chemical elements, planets

¹⁰ Blaise Pascal, *The Pensées*, no. 335, Eng. tr. by John Michael Cohen (Bristol: Penguin books, 1961) pp. 119-120.

around stars having a stable energy production long enough to let life evolve, etc.). The observations of all these critical coincidences, which are necessary but not sufficient conditions for developing life, and employing only the methods of science, does not reveal by itself the existence of an intelligent Creator. That which on the philosophical level manifests a purpose, and on the theological level can be interpreted as a gift and a qualitative source for ultimate meaning, on the empirical level can only manifest itself as a kind of mathematical coherence, quantitative tuning or right proportion among physical magnitudes.

*Cosmic History and History of Salvation:
the Novelty of a New Creation*

Christian theology often uses the notion of “history of salvation,” and highlights the central role that the Paschal mystery of Jesus Christ occupies in it: his particular role of mediator at the beginning and end of times. A comparison with scientific thought thus forces the theologian to give some elements that help reading this history of salvation against the backdrop of the history of the universe as a whole, as it is presented, today, by the natural sciences.

From the chronological point of view, the stretch of time between the appearance of human beings on earth and the date of the first texts of the Scriptures was very long. If, by way of comparison, we indicated with the conventional length of one year (365 days) the time that elapsed from the formation of the earth until now, the first life forms would appear on the planet after around three months, but the *Homo sapiens* would only appear in the last 12 minutes, and Abraham’s call would only be placed about thirty seconds ago. Finally, following the same comparison, only 14 seconds would separate us from Jesus’ birth in Bethlehem. Sacred history, then, would generally present itself as a quite “recent” event. We could also add a further reflection. Ethnologists believe that a people

based on oral tradition would not be able to maintain the historical memory of events or cultural contents for a period longer than about ten thousand years. This inability is due to the intervention of disaggregation phenomena such as migrations, mass diasporas, climate changes on a planetary scale, natural disasters, and so on. Therefore, it seems legitimate to ask how a group or a community of human beings could keep the historical memory of a primitive divine revelation that, if conveyed to our ancestors — that is, the first human beings — would have taken place tens of thousands of years ago.

Though the quantitative dimension has a certain relevance, I believe that, in order to understand the logic of the history of salvation, it is not the determinant way to approach the question. A “classical” answer given by theology — still valid today — is to stress that an author inspired by God could have written, precisely because of this inspiration, much more than what human historical memory could have preserved. Moreover, a judgement on the historical meaning of a certain slot of time — such as that between the appearance of *Homo sapiens* and the coming of Jesus Christ — is always relative to the overall extent of the whole phenomenon under consideration. But this dimension is unknown to us, as we do not know where we can set the end of history. The height and fulfilment of divine revelation as realized in Jesus Christ’s coming to earth could, then, be either the chronological peak of a long historical-evolutionary process that had already been through the longer segment of its duration, or, the moral apex of a historical journey destined to stretch for a much longer time into the future. In both cases theological expressions such as the “fullness of times,” “apex of Revelation,” or “Christ the center of time,” remain meaningful, because the relationship between Christ and history transcends history itself. It is not Christ who must be “measured” by the laws of historical development, but

the whole stretch of history that receives meaning from His paschal mystery.¹¹

Theology's interest in dialoguing with the sciences could also be spurred by a debate on future historical scenarios, particularly as relates to the "new creation" doctrine, the promise of a new heavens and a new earth (cf *Is* 65:17; *Rom* 8:22-23; *Rv* 21:1; *2Pt* 3,13). The topic is parallel to what I stated above in relation to the "history of the origins," since the Church professes its faith in a Revelation where Jesus Christ is not only the Alpha (the *beginning*), but also the Omega (the *end*). There is, however, an important difference. If, on the time elapsed so far, theology and science can more easily compare their views on a "discussion of the origins," the debate is much more difficult concerning future time, which has yet to occur. Indeed, when we discuss the "origin of times," we know that the biological beginning of the human species on Earth must match the time that has elapsed in the history of salvation, whose subject is the human being; when we speak of the "end of times," the debate is less easy. The possible or foreseeable duration of the history of the material universe does not necessarily coincide with the fraction of time that will accompany the history of salvation until the "end of time." And this is the case simply because the biblical-theological notion of the "end of time" (cf *Mt* 24:3; *Rv* 10:5-7; cf also *1Cor* 10:11; *Jude* 1:18) does not coincide with the physical-biological notion of the "end of conditions allowing for life on earth," nor does it coincide with an end of the physical universe globally intended because, once the

11 Classical readings on the understanding of time and history in Christian theology are, for instance, Oscar Cullmann, *Christ and Time. The Primitive Christian Conception of Time and History* (London: SCM Press, 1971); Jean Mouroux, *The Mystery of Time. A Theological Inquiry* (New York: Desclée, 1964); Hans Urs von Balthasar, *A Theology of History* (San Francisco: Ignatius Press, 1994). A valuable summary is offered by John Paul II, *Tertio millennio adveniente*, November 10, 1994, nn. 9-10 (Vatican City State: LEV, 1994) and *Dies Domini*, May 31, 1998, nn. 8-18, 74-75 (Vatican City State: LEV, 1998).

created universe has come into being, in a strictly physical sense it will never end.¹²

Even if, so far, I have used the term “history” in a very general sense, in view of a correct comparison between theology and the natural sciences we should, first of all, clarify that the universe, strictly speaking, does not have a “history,” but simply a temporal development. Only human beings are subjects of history, because they “make” history, for better or for worse, with their freedom. It is *this history* that is fulfilled at the “end of time,” a fulfilment where the desires for justice, for goodness and salvation denied by sin, but satisfied by Christ once and for all on the cross, will be appeased. The temporal duration of the future physical possibilities of the universe – the fact, for example, that the latter has an unlimited temporal expansion or, instead, ends through implosion – does not determine the conditions of possibility, nor the strictly historical context, in which the ultimate fulfilment of the history of salvation and the moral judgment that accompanies it will take place. Similar reflections should be made when switching from the future setting of the universe as a whole to the more modest (but for us more important) one relating to our solar system. Phrases like “end of the world,” “Last Judgment,” or “Christ’s return” cannot be put in a direct relation with the limited time during which the physical-biological conditions allowing life on Earth will last (conditions that are essentially linked to thermodynamic evolution and to the hydrogen reserves of the Sun, the star we depend on for everything). These conditions also include the possibility that our species would migrate towards more hospitable planetarian environments. Radicalizing the search for similar correspondences would be the

¹² A deep and global physical and chemical transformation of all the material elements and the coming of a completely new cosmic scenario, would not be enough, as such, to cause *the end*. The only way to come to this end is “annihilating the being of the cosmos”; but such a notion is as metaphysical as that of the origin of the cosmos from nothing. On this subject, cf Thomas Aquinas, *Summa Theologiae*, I, q. 104, a. 4, who pointed out that God does not annihilate what he called into being.

example of a naïve and damaging concordism. Perhaps, it would even manifest a presumptuous desire to speak when remaining silent would be better. For theology to take into account the results of the sciences does not mean forcing them to coincide with the history of salvation, but rather better understanding the inexhaustible hermeneutic richness of the latter in light of the former.

The universe will be transformed in ways that are unknown to us. This will probably entail some degree of destruction (cf *Mt* 13:24-25; *Rv* 6:12-14), but also the preservation of what, in the universe, belongs to God's plan of creation. "We do not know the time for the consummation of the earth and of humanity, nor do we know how all things will be transformed. As deformed by sin, the shape of this world will pass away; but we are taught that God is preparing a new dwelling place and a new earth where justice will abide, and whose blessedness will answer and surpass all the longings for peace which spring up in the human heart."¹³ From the letters of St. Paul and St. John we know that charity, particularly the stable gift of the Holy Spirit, already sent into the world and present as a "pledge" in the heart of believers (cf *2Cor* 1:22; *Eph* 1:14), represents the "connection" between what we build in freedom and in union with Christ on this earth and what we will find again in the future world. In this case, too, a certain "principle of solidarity" between human beings and the universe is at work, as human history redeemed by Christ and built in charity will affect the future transfigured universe more than the extent to which time and the future settings of the physical world will affect our biological life. The physical conditions of a "transfigured" universe cannot be known empirically, simply by extrapolating from current knowledge. Similarly, the qualities of Christ's resurrected body, firstfruit of the new creation, cannot be directly deduced from the physical or biological properties of His true human nature, as we can know it in history.

For a theology of Revelation and history that wants to take into

¹³ Vatican II Council, *Gaudium et spes*, no. 39.

serious examination the scientific *datum*, there are two further questions to be dealt with. The first — looking towards the past — concerns the relationship between human sin and the physical span of time of the universe that preceded that event. The second — looking towards the future — entails explaining why the theological reading of a certain “finality” from the origin of the universe until the appearance of human beings is certainly possible, while this reading no longer seems effective when we move towards future cosmological scenarios. Indeed, if the evolution of the universe and life can be read as a great convergence, in time, towards the physical conditions that made it possible for human beings to appear on the scene of the world, these same conditions, as already pointed out, have a very limited “time window” and are destined, in the future, to disappear, together with life itself.

Concerning the first question, cosmology and the earth sciences know of no substantive change in the phenomenology of physical or biological processes shown just after the appearance of *Homo sapiens* (and thus, after original sin) when compared to their functioning during the whole time prior to that extraordinary appearance. For theology, then, explaining the introduction of a degree of “disorder” into the universe by appealing to human sin becomes difficult. If, moreover, this disorder is also related to that conflictual and less “optimistic” view of physical and biological evolution — which we commonly denote with the notions of geological catastrophes, fight for survival or natural selection — we would be faced with a great mystery: how could the history of the universe and of life preceding human beings’ appearance contain, in itself, the consequences of a sin that was committed after humankind’s entrance into the world? In this case, the idea of a pre-existing solidarity between humankind and the material world could only be “read” within the mystery of the Word Incarnate as conceived in God’s prescience, thus attributing a cosmic and somewhat meta-temporal dimension to salvation in Christ. This would also entail reinterpreting the meaning of the link

between original sin and death, given that the dissolution of the living into the biological realm would seem to precede the moral trial of our ancestors. A series of problems are raised here, which touch up on the “historical” dimension of original sin and, perhaps, the sin of angels too, who share many things with the human universe, first and foremost their creaturely nature, though not its historical condition. The consequences of their sin on creation could be real but meta-historical, and therefore, unknown to us.

The second question mentioned above derives from the observation that a “teleological” reading certainly possible in contemporary cosmology — that is, the view of an evolving cosmos whose fulfillment lies in man’s appearance on Earth (Anthropic fulfillment) or even in the gracious gift of the Incarnation (Christological fulfillment) — would indicate only a “provisional” fulfillment. The reason for this seems to be that the conditions that make life possible on our planet, as previously underlined, will not last for long. It is certainly true that forced parallelisms between the history of salvation and the development of the universe should not be sought, and that Christ’s centrality in history transcends history itself without being measured by it. Yet, to state it otherwise, it is also true that the physical-temporal development of the universe and the history of salvation seem to correspond better in the time period from the origin of the world until Christ’s resurrection than from the Resurrection onwards.

Concerning these two questions, theology can only propose a few reflections. The lack of empirically known changes in the behaviour of the physical universe before and after the original sin could be explained by saying that the latter mainly has repercussions for the “relationships” between human beings and God, on the one hand, and between human beings and nature on the other, but not for nature *as such*. The fact that a universe in evolution entails a fight for survival, progress by trial and error, and a certain level of disorder, should then be “brought into” the mystery of creation: the degree to

which these features of evolution depend, as a cause, from human beings' sin can be known only by God, whose plan of creation and salvation is conceived beyond time, and whose ultimate reasons neither theology nor science can investigate. For our understanding of what is death, then, this state of affairs would suggest reading death mainly as the breakup of the original relationship with God, as the introduction of an existential affliction that endures the experience of limits and finiteness with suffering and fear, both marks of the loss of a filial relationship. This formulation would leave theology with enough room to distinguish death thus intended from the natural completion of a biological time-span. In the logic of a biological process, precisely because it is a thermodynamic process, the end is necessarily implied in the origin and in growth. Before original sin, human beings, like any other living beings, could have concluded the finite time of their biological life. For human beings this was nothing but the condition of a historicity intended as a trial, that is a free response, to enter eternal communion with God. After sin, the end of biological life is so overburdened with the tragedy of the existential and moral consequences of the rejection of God that it is, reasonably, called *death*. As not a few philosophers have pointed out, animals perish, but only humans die.

Though the second question raised above, whereby cosmic evolution would be directed towards the appearance of intelligent life, the latter being destined to survive only for a limited time, seems to point out a kind of cosmic contradiction, we cannot exclude that the problem could contain a hidden meaning. Perhaps the universe, like the human species, could be called to its "Paschal mystery:" the new creation may require that the whole physical universe reach its final fulfilment through a stage of decay, death and destruction, whose large timing is unknown to us. From the theological point of view, such a perspective could, perhaps, fit within a Christocentrism of universal reach, one that had first seemed weakened when assessed against the backdrop of future dramatic scenarios. Ultimately, we

would be faced with an attractive analogy. There is a mysterious correspondence between the fragility of the individual human being when considered against the backdrop its life on Earth, and the fragility of the human species, as a whole, considered against the backdrop of the universe. Just as each of us asks the question “why do I have to die?,” the entire human terrestrial life poses the question “why does our time-window vanish into the history of the physical universe?”.

Concluding Observations

Many of the arguments raised here must confront new issues, issues which theology is asked to deal with using caution and wisdom. In particular, on subjects where sound theological lessons by Tradition or official teachings by the Church Magisterium are lacking, Catholic theologians are allowed to show a certain pluralism of opinion, and to suggest various solutions. These discussions are certainly still open, but they are not superfluous, because they favor the development of a first hermeneutic programme, whereby the sciences and theology strive to understand, in each one’s respective area of study, what makes them similar or different, when their conclusions entail reciprocal influence and when, conversely, they pertain to different realms.

In this work of clarification and hermeneutic progress, the need for a reading of the Holy Scriptures that avoids the double risks of fundamentalism and rationalism has gained increasing relevance in the past years. Fundamentalism is common, today, precisely in those debates between theology and the natural sciences that approach the Holy Scriptures with superficiality, and, sometimes, even with ideological prejudice. A document entitled *The Interpretation of the Bible in the Church*, published in 1993 by the Pontifical Biblical Commission — a team of scholars who provide expert advice to the Catholic Church Magisterium — puts the issue as follows:

“Fundamentalist interpretation starts from the principle that the Bible, being the Word of God, inspired and free from error, should be read and interpreted literally in all its details. But by ‘literal interpretation’ it understands a naïvely literalist interpretation, one, that is to say, which excludes every effort at understanding the Bible that takes account of its historical origins and development. It is opposed, therefore, to the use of the historical-critical method, as indeed to the use of any other scientific method for the interpretation of Scripture. [...] The basic problem with fundamentalist interpretation of this kind is that, refusing to take into account the historical character of biblical revelation, it makes itself incapable of accepting the full truth of the Incarnation itself. As regards relationships with God, fundamentalism seeks to escape any closeness of the divine and the human. It refuses to admit that the inspired Word of God has been expressed in human language and that this Word has been expressed, under divine inspiration, by human authors possessed of limited capacities and resources. For this reason, it tends to treat the biblical text as if it had been dictated word for word by the Spirit. It fails to recognize that the Word of God has been formulated in language and expression conditioned by various periods. It pays no attention to the literary norms and to the human ways of thinking to be found in the biblical texts, many of which are the result of a process extending over long periods of time and bearing the mark of very diverse historical situations.”¹⁴ It is by avoiding such a fundamentalist reading of the Bible, I wish to add, that apparent conflicts between the concepts of creation and evolution (which continue to absorb a good part of public debate, especially where deeper theological education is lacking) can easily be solved.

More generally, it should be stated that the Holy Scriptures are compatible with different scientific and philosophical views on

¹⁴ Pontifical Biblical Commission, *The Interpretation of the Bible in the Church*, April 15, 1993 (Vatican City State: LEV, 1993); original text in French, in *Enchiridion Vaticanum* (Bologna: EDB, 1995), v. 13, nn. 2971 and 2974.

the cosmic universe and life, purported that these do not directly oppose the existence of a personal God, a free and intelligent Subject capable of creating according to His will. Therefore, there is no need to demand that the Bible “espouse” a particular cosmology. “Fundamentalism likewise tends to adopt very narrow points of view. It accepts the literal reality of an ancient, out-of-date cosmology, simply because it is found expressed in the Bible; this blocks any dialogue with a broader way of seeing the relationship between culture and faith.”¹⁵ Today, theology can draw inspiration from this more mature view, without relinquishing the possibility of giving answers to those *ultimate questions* on history’s origin and goal that the biblical Revelation has conveyed, and on which scientists, like all human beings, keep on interrogating themselves.

¹⁵ *Ibid.*, no. 2978.