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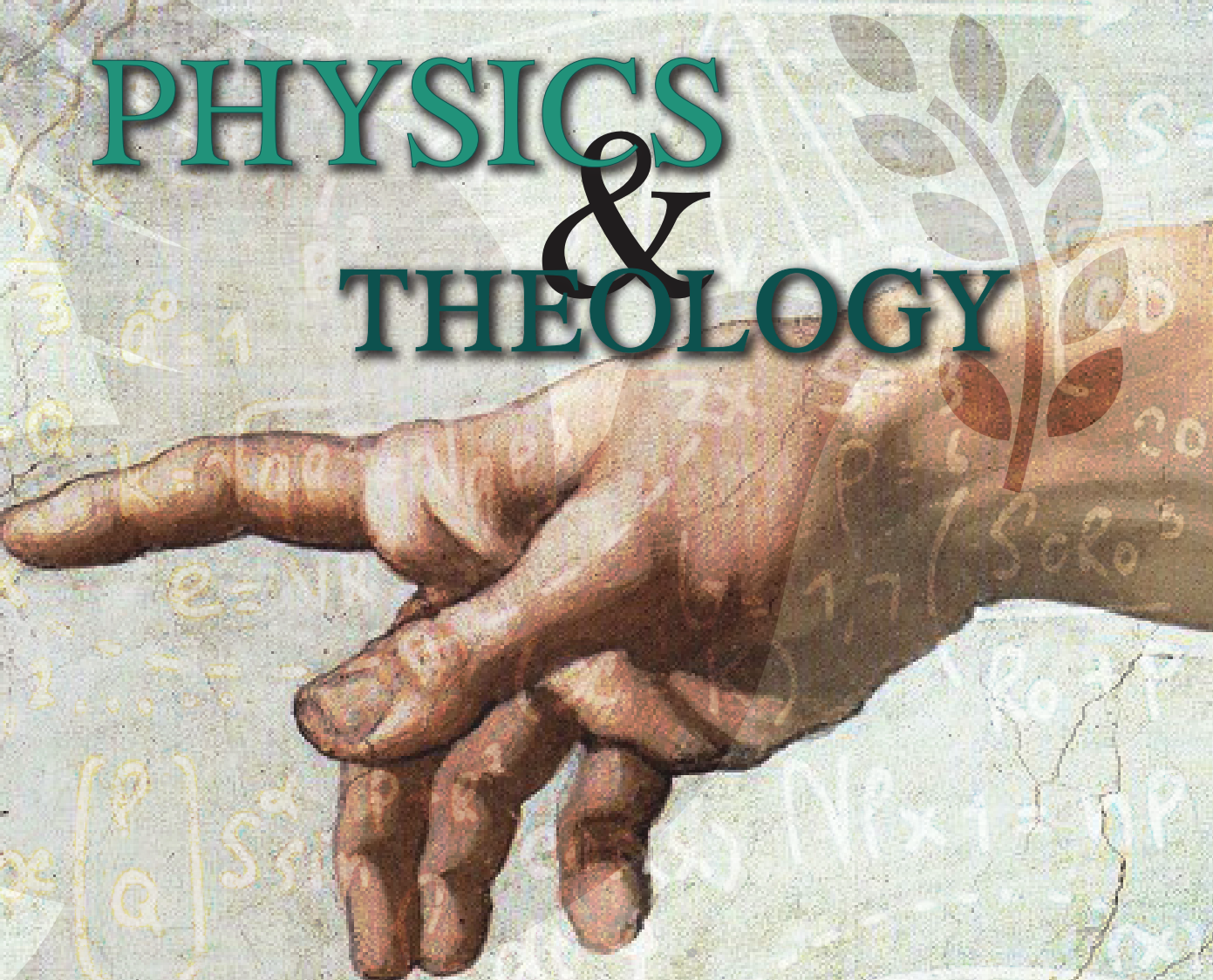

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Analogia is a peer-reviewed academic journal dedicated to the scholarly exposition and discussion of the theological principles of the Christian faith. A distinguishing feature of this journal will be the effort to advance a dialogue between Orthodox Christianity and the views and concerns of Western modes of theological and philosophical thought. A key secondary objective is to provide a scholarly context for the further examination and study of common Christian sources. Though theological and philosophical topics of interest are the primary focus of the journal, the content of *Analogia* will not be restricted to material that originates exclusively from these disciplines. Insofar as the journal seeks to cultivate theological discourse and engagement with the urgent challenges and questions posed by modernity, topics from an array of disciplines will also be considered, including the natural and social sciences. As such, solicited and unsolicited submissions of high academic quality containing topics of either a theological or interdisciplinary nature will be encouraged. In an effort to facilitate dialogue, provision will be made for peer-reviewed critical responses to articles that deal with high-interest topics. *Analogia* strives to provide an interdisciplinary forum wherein Christian theology is further explored and assumes the role of an interlocutor with the multiplicity of difficulties facing modern humanity.

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NOTE
FROM THE SENIOR EDITOR

It was a joy for me to participate in that fruitful conference in Sofia, the papers of which are published in this volume, first, because of the crucial importance of its subject, and second, because of the high quality of the presentations. I thank both Fr. Knight and Dr. Tanev, the two guest editors of this volume, for their work not only in organising that fertile conference, but also for editing these texts.

– ***Fr Nikolaos Loudovikos,*** Senior Editor

NOTE
FROM THE GUEST EDITORS

Among Western Christians, the publication of Ian Barbour's Issues in Science and Religion, in 1966, provided the impetus for the development of a rich "science-engaged theology." Largely through the influence of that book, associations of one kind or another – either formal or relatively informal - had, by the 1990's, become common in the Western Christian world as means by which those interested in this pursuit could interact with one another and develop their ideas further.

Among Eastern Orthodox Christians, however, there was a slower start. While there was some interesting work by individual scholars and embryonic forms of something more structured and interactive were to be found here and there, it was not until the twenty-first century, with the setting up of the Athens-based Science and Orthodoxy around the World (SOW) project, that a truly structured and international exploration began. This project - funded by the Templeton World Charity Foundation – began by charting the ways in which the interaction of science and theology had already progressed within the different parts of the Orthodox community. Subsequently, specific programmes were developed through which these early (relatively isolated) explorations could be encouraged to interact in a more collaborative and fully international way.

In the later stages of this project, interactions between Orthodoxy and particular scientific disciplines were encouraged, and the present collection of essays represents some of the results of this later stage of the project in relation to physics. Arguably, it is physics that can – more than any other scientific discipline – contribute most to the new, science-engaged theology. This is because the way in which - since the early twentieth century developments of relativity theory and quantum mechanics – it has posed important questions about the conceptual framework within which our understanding of reality must be developed.

Physics is perhaps the only science that has been transforming itself since the beginning of the 20th century by engaging in several epistemological revolutions. One could claim that there has not been

any other science that has manifested such sharp epistemological self-awareness and ability for self-reflection about its own ways of knowing. This is what has made physics a scientific discipline capable of formulating epistemological insights that could be relevant to other disciplines, and to theology in particular. This may be especially true of theology in its Orthodox form, which - as Christos Yannaras has observed - is grounded in ecclesial experience and is based on an apophatic attitude to language and reality similar to that which has emerged within modern physics. Because of this, the "slower start" that has been evident in the Orthodox world may be seen as an opportunity for its theologians to make a unique and substantial contribution to the encounter between theology and physics.

After arranging a conference on this topic in Sofia, Bulgaria, and then choosing some of the best contributions to this conference as the basis of the present collection of essays, the editors went on to invite others to make contributions that would provide a more balanced survey of present thinking. However, there was no editorial perspective to which contributors were asked to conform, and they had absolute liberty to provide a personal perspective.

Not all those who were invited to contribute to this special issue are from within the Orthodox Christian world. This is a key part of the design of the collection, which reflects the way in which any fruitful encounter between theology and physics goes beyond specific faith traditions or Christian denominations, leaving space for creativity and insights driven by the unique perspectives of each of them. The Muslim physicist, Nidhal Gessoum, for example, provides perspectives from physics that Orthodox Christians can surely affirm, while the same can be said of the Roman Catholic theologian, Thierry Magnin, who also draws out parallels between Eastern and Western Christian theological perspectives. Todor Veltchev, in a comparable way, was inspired by his Evangelical background to formulate the principles of contemporary Christian scientific apologetics in a way that is far from irrelevant to Orthodox thinking. The rest of the contributors (Georgi Kapriev, Fr. Nikolaos Loudovikos, Fr, Christopher Knight, and Stoyan Tanev) are, however, all Orthodox, and they explore the question of how physics and theology interact from a distinctively Orthodox perspective.

Whatever the particular background of each contributor, they can, the editors believe, together offer what we believe this collection of essays will provide: the foundation for the continuing development of the kind of science-engaged theology that can deepen our understanding of the Orthodox Tradition.

– Fr. Christopher C. Knight
& Stoyan Tanev Guest Editors
Feast of Mid-Pentecost, May 29, 2024

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Physics and Religion: what kind of relation?

NIDHAL GUESSOUM
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In just a few centuries, physics has established itself as the most fundamental and, arguably, the most powerful of all sciences, able to explore and reveal facts at the smallest to largest scales of nature, from quarks to galaxies, and at the shortest to longest times (billions of years and beyond). It has also come up with and established bewildering theories, from quantum mechanics to inflationary cosmology. And with all this, it has largely changed people's view of nature and the universe, perhaps even their 'worldviews', their understanding of their place in the universe. On the other hand, it is difficult to describe religion's trajectory over the last few centuries, even if one can delineate general features of religion, partly due to its huge spectrum of forms as well as the wide variety of beliefs, acts, and codes of behaviour that members and practitioners of various religions adopt. In this paper, I attempt to outline the main characteristics of both physics and religion in order to highlight the similarities or close concepts that can help each learn from the other, but also the ideas or positions that we may find in each and which can sometimes lead to conflict, opposition, and rejection of the other side. In particular, I focus on the concepts of 'truth(s)', 'explanation', 'interpretation', 'reality', 'complementarity', 'humility', and others, dissecting them in an attempt to draw lines of convergence or divergence between physics and religion.

Introduction: Delineating physics and religion first; can they be related at all?

Physics can be defined as the study of material (almost always non-living) objects and their phenomena (including, and especially, changes) and laws (relations between physical factors that describe how the phenomena occur, under what conditions, to what extent, etc.). Laws can be formulated in various ways, empirically (directly from observations and experiments), analytically, semi-analytically, etc.;

they can also be derived (top-down) from higher first principles, or constructed bottom-up (from lower-level laws).

In just a few centuries, physics has established itself as the most fundamental and, arguably, the most powerful of all sciences, able to explore and reveal facts at the smallest to the largest scales of nature, from quarks to galaxies, and at the shortest to the longest times (billions of years and beyond). It has also come up with and established bewildering theories, from quantum mechanics to inflationary cosmology. And with all this, it has largely changed people's view of nature and the universe, perhaps even their 'worldviews', their understanding of their place in the universe.

However, it is important to explore the characteristics of physics: How 'objective' is it (independent of the actor/author's views and ideas)? Is it universal (independent of local culture)? Can the results that it presents be considered 'facts'? Do its theories keep changing, or are any to be considered as 'established'?

Physics, like the rest of (natural) science, is a collective human endeavour to understand the physical world; it *aims* to be (and most scientists insist that it does succeed in being) objective and universal, despite personal and social effects. The two main features that support its striving to be objective and universal are: a) the fact that its claims are based on evidence; b) in establishing results, it relies on independent checks (the peer-review process, despite its shortcomings, and the insistence on falsifiability and repeatability). Still, scientific knowledge (including in physics) is tentative (awaits independent confirmation) and cumulative.

Religion, on the other hand, can be defined as a system of beliefs, rituals or practices (required or recommended), and codes of behavior.

It is (generally) characterised by the following: a) it is usually based on faith in supernatural entities or agents, belief in sacred texts and/or prophets; it gives importance to tradition (ideas and practices that have come down through the ages), and the personal experience of the believer/follower of the religion; b) the sacred texts are sometimes taken literally, but often interpreted metaphorically, and are believed (by the religion's followers and often by others) to contain some wisdom or truths; c) perhaps most importantly, religion aims to give meaning, purpose, value, and a sense of identity to the believer/follower.

Contrary to physics/science, however, it is difficult to describe religion's trajectory over the last few centuries, even if one can delineate general features of religion. Doing that is difficult partly due to the huge spectrum of forms that religions take as well as the wide variety of beliefs, practices, and codes of behavior that members and practitioners of various religions adopt.

Now, physics and religion are sometimes said to be two 'explanatory' approaches to the world. That is because they claim to describe "reality", the 'world', or 'existence', although these terms are (clearly) rather fuzzy and most likely mean different things in the two domains (in physics and in religion). In fact, physics uses different terms for these concepts: physical conditions instead of 'reality'; universe (or the galaxy or the solar system or whatever system) instead of 'world'; and 'state' instead of 'existence'. One does find those fuzzier terms used in philosophical discussions of physics topics (quantum 'world', cosmology, etc.) but then the discourse has shifted from scientific to philosophical and sometimes even theological or at least metaphysical.

Physics and religion also have some essential differences in the methods they adopt and the types of knowledge they present. Religion tends to be traditional (adopting ideas passed on through history), while physics is more 'modern' (i.e., scientific, method- and evidence-based). Religion is more personal, experiential, and subjective, while physics is more collective and objective (removing the individual actor from at least the result). Religion is rather informal (beliefs do not have to be rigorously justified), whereas physics is more formal (methodical). Religion is more intuitive and more readily accepts 'common sense', whereas physics and science insist on testing and establishing any claim methodically and rigorously.

Philosophical issues from physics through history

Physics was for many centuries a branch of philosophy. Until modern times, physics was referred to as 'natural philosophy', at least the part of philosophy that dealt with knowledge (epistemology) and started with logic, the methods of rigorous reasoning.

In antiquity, 'physics', due to the lack of probing instruments, was largely limited to the study of the motions and changes of objects and

their causes. Indeed, the nexus between causes and effects was long a rich source of discourse and debate among philosophers. Aristotle famously divided causes into four types: material causes (what various objects and elements of the phenomenon under consideration are made of), efficient causes (the sources of the changes being observed), formal causes (from 'form' or 'essence', what determines the types of objects taking part in the phenomenon), and final (what the objects are to become, what 'final' state their evolution is to reach, etc.). The last type of 'cause', often described as 'teleological', is the most objected to, modern physics/science rejecting the idea that phenomena have any 'destination' that they are taking objects to, and insisting that initial states and the laws governing those phenomena determine the next/final state (although here one gets into the debates over 'determinism', which I will come back and address briefly later).

In mediaeval times, religion had become a central player in all debates, including those about nature and physics. Natural phenomena were now, at least in the Euro-Asian region (the Judeo-Christian-Islamic world), seen and regarded as God's works. Their regularity and order were highlighted by scriptures (the Bible and the Qur'an) explicitly and repeatedly, and they were considered a prime argument for God's existence and his creation of, and action in, the world.

Perhaps a short detour into physics/science in the Islamic Era can be useful in highlighting this interconnection between theology and natural science in medieval times.[1]

Al-Kindi (801–873 AD), one of the earliest Arab Muslim philosophers, a polymath (physician, mathematician, and music theorist) and early adopter of and subscriber to peripatetic (Aristotelian) philosophy, is perhaps most famous for the Kalam cosmological argument: that there must be a God/Creator, as cause-effect chains cannot go back indefinitely; there must be a 'prime mover' or 'prime initiator' of things.

Ibn Sina/Avicenna (980-1037 AD), one of the greatest philosophers, physicians, and polymaths in Islamic civilisation and even in all of history, introduced subtle but important distinctions between existence and essence. Avicenna insisted that we must look beyond the object's

[1] For a more detailed review of Islam's past and present engagement with science, see Nidhal Guessoum, 'Science, religion, and the quest for knowledge and truth: An Islamic perspective,' *Cultural Studies of Science Education*, 5 no. 1 (2010): 55-69.

movement, to the source of its existence and the 'principle' behind it, i.e. the creator of the world.

Avicenna also insisted that while the world can be eternal (alongside God), it is contingent and not necessary. He also divided creation into 4 different types: *Ihdath*, i.e. creation of nature's entities, both temporary and eternal; *Ibda`*, i.e. creation – without intermediary – of eternal non-decaying creatures; *Khalq*, i.e. creation through other agents; and *Takween* (formation), i.e. creation through worldly, decaying, temporary agents.

Al-Ghazali (1058-1111 AD), one of the greatest theologians in the history of Islam, is perhaps most famous for introducing 'occasionalism', that God re-creates the world at every instant with every particle and every event/phenomena; he thus constantly acts in the world, and regularity in the phenomena, what people describe as (or ascribe to) 'laws' are simply 'God's habits', which he is free to break at any time, what one would then regard as miracles.

To further show the strong connection between physics/science/astronomy in the classical Islamic worldview, we may recall Al-Battani (850-929 AD), a very illustrious astronomer, who wrote: 'By focusing attention, observation, and extensive thought on astronomical phenomena, one is able to prove the unicity of God and to recognize the extent of the Creator's might as well as His wide wisdom and delicate design.'[2]

Likewise, Al-Biruni (973-1050 AD), one of the greatest natural scientists in the Islamic and medieval era, explicitly stated that the motive behind his research in physics and astronomy is the Qur'anic verses: '*Those who reflect on the creation of the heavens and the earth (and say): Our Lord! Thou hast not created this in vain! Glory be to Thee…*' (3:191).

From 1543 onwards, a scientific revolution occurred over two centuries or so, starting with Copernicus's heliocentric hypothesis, which soon was strengthened and supported by Kepler's laws of planetary motion and Galileo's revolutionary observations of the heavens using a telescope, the whole enterprise culminating in Newton's

[2] Muntasir M. Mujahed, *Usus al-Manhaj al-Qur'aniy fi Bahth al-'Ulum al-Tabi'iyyah*" [The bases of the Qur'anic methodology in the study of the natural sciences] 2nd edition (Jeddah: ad-Dar as-Su'udiyya li n-Nashr wa t-Tawzi', 2004), 100.

Principia, which combined laws of motion and of gravity, all described mathematically using calculus.

This new physics later came to be labeled 'Classical' (to Mechanics was added the Electromagnetism of Faraday, Maxwell, and others). Most importantly, as far as our discussion here goes, is the fact that this 'classical physics' was wholly deterministic and naturalistic: the entire world could, in principle, be traced, past to future, cause to effect, using just initial conditions and the laws of physics.

Newton's physics provided, in principle, mathematical descriptions of all earthly and cosmic phenomena, with God needed only for the initial creation and for miracles, if they ever occurred, being seen as violations of the laws and order of the universe.

And with his physical explanations of how the world works, both in the heavens and on earth, Newton allowed others to introduce a 'mechanical universe' that had, in Laplace's famous retort to Napoleon's question, 'no need for the God hypothesis'. In Laplace's physics/mechanics, the precise knowledge of initial conditions and of the laws of the universe allows one (theoretically) to determine its entire future history.

The only thing for which God was still needed was the original act of creation. Naturalism and Deism (God as an initial creator of the universe but not as an actor in it after that) became essential ideas.

This would change with 'Modern Physics': Quantum Mechanics brought in a fundamental randomness and a probabilistic (thus indeterministic) description of (at least) the subatomic world; and Relativity destroyed any absolute, objective characteristics of space, time, energy, and other physical quantities, which then depended on the observer.

Quantum Mechanics has various 'interpretations', i.e. what the results (of calculations and observations) actually represent or mean, but the most famous one is the Copenhagen interpretation (named for the school of physicists, led by the great Niels Bohr, who came up with that interpretation and publicised it). It stipulates that each property of the quantum object is some kind of probability cloud, which has no specific value and evolves through time; however, the act of measurement 'collapses' the cloud into specific states with 'real' physical quantity values.

This random/probabilistic vs. deterministic view of the world led to a famous discussion between Bohr and Einstein, the latter strongly opposing that 'indeterministic' description of the world. As the anecdote goes, over a heated dinner discussion, Einstein told Bohr: 'God does not play dice', to which Bohr replied: 'Albert, don't tell God what He can or cannot do…' As Witham comments on the encounter: 'Einstein operated out of ancient Middle Eastern monotheism, which clashed with Bohr's ancient Asian precepts that defined reality as a godless flux… Thus, no argument by Bohr could persuade Einstein, who could not abandon Spinoza's God.'[3]

Various great physicists later took one side or the other of this debate and adopted various philosophical positions on the thorny question. Heisenberg, in particular, stressed that his uncertainty principle (that some pairs of physical characteristics, e.g. the position and speed of a particle) had allowed for a new acceptance of the 'natural language' of religion. As he put it: 'After the experience of modern physics, our attitude toward concepts like mind or the human soul or life or God will be different from that of the nineteenth century.' [4] Most importantly, Heisenberg realised – and told Bohr – that many people would move to use the new indeterminacy as 'an argument in favor of free will and divine intervention.' [5]Still, others were very cautious; Eddington had remarked to the 'religious reader' of his *New Pathways* in Science book that 'I have not offered him a God revealed by the quantum theory, and therefore liable to be swept away in the next scientific revolution…'[6].

By the late twentieth/early twenty-first century, randomness (both quantum, which is fundamental, and chaotic, which is not fundamental and is only due to our limitedness in knowing things precisely) became an important fixture in physics and other scientific fields as well as in technology. Indeed, randomness was found to be quite ubiquitous and essential in the universe, from galaxy formation to weather and climate. Moreover, Laplace's claim of total determinism was shown to be wrong

[3] Larry Witham, *The Measure of God: Our century-long struggle to reconcile Science and Religion* (San Francisco: Harper San Francisco, 2005), 138.

[4] Werner Heisenberg, *Physics and Beyond. Encounters and Conversation*, trans. A.J. Pomerans (London: G. Allen & Unwin, 1971), 140.

[5] Ibid., 91

[6] Arthur Eddington, *New Pathways in Science - Messenger Lectures, 1934* (Cambridge: Cambridge University Press, 1947), 307.

even for planets in the solar system, which dynamics were found to have some degree of chaos.[7]

This probabilistic vs. deterministic debate and the Bohr-Einstein exchange above best highlight the connections between modern physics (or at least some important topics of it) and theology (most generally, not related to any specific religion).

Lines of divergence and convergence between Physics and Religion

One major and fundamental source of friction (sometimes considered a point of irredeemable divergence) between religion (at least with traditional views) and science (including but not limited to physics) is its methodological naturalism, which excludes any reference to God or any supernatural agents (spirits, angels, etc.) when describing or explaining natural phenomena. I do not believe that this is necessarily a point of rupture and conflict between the two, as philosophers and rational theologians in past centuries (the Mu`tazila rational theology school, Ibn Rushd and other Muslim or non-Muslim philosophers) not only accepted the concepts of 'secondary causes' and laws which rule natural phenomena but saw no conflict between that and their firm belief in God and religion.

When Carl Sagan, the late astronomer and science advocate and populariser, gave the Gifford Lectures, he, a nonbeliever, spoke of the relation between religion and science and described the latter as 'informed worship.'[8] His wife, the author Ann Druyan, who wrote the introduction to the book, noted: 'he never understood why anyone would want to separate science, which is just a way of searching for what is true, from what we hold sacred, which are those truths that inspire love and awe.'[9] She added: 'His argument was not with God but

[7] Jacques Laskar, 'A numerical experiment on the chaotic behaviour of the Solar System', *Nature* 338 (1989): 237–238; 'The chaotic motion of the Solar System. A numerical estimate of the size of the chaotic zones', Icarus 88 (1990): 266–291; 'Is the Solar System stable?' in Chaos, edited by Bertrand Duplantier, Stéphane Nonnenmacher, Vincent Rivasseau (Basel: Birkhäuser, 2013), 239-270.

[8] Carl Sagan, *The varieties of scientific experience: A personal view of the search for God*, edited by Ann Druyan (New York: Penguin, 2007), xiii.

[9] Ibid., xi.

with those who believed that our understanding of the sacred had been completed.'[10]

So we must then ask: is there divergence or convergence, between science (here most valiantly represented by physics) and religion? Indeed, not all scientists and philosophers agree about any great harmony between religion and science. Various possible typologies of relations between the two have been proposed:

i. Ian Barbour, the late physicist and philosopher famously proposed four categories of interaction between science and religion: conflict, independence, dialog, and integration.[11]

ii. John Haught, the contemporary Christian theologian who specialised in issues at the interface of science and religion, has also suggested four different ways: conflict, contrast, contact, and confirmation.[12]

iii. Freeman Dyson, the late famous physicist and wide-ranging thinker, suggested complementarity (with separation) between science and religion, and Stephen J. Gould, the late paleontologist, proposed the NOMA (Non-Overlapping MAgesteria) principle.[13]

iv. John R. Staver, a science education professor, generally summarised the different possible relationships as: cousinly, mutually respectful, non-overlapping, competitive, proximate-ultimate, dominant-subordinate, and opposing-conflicting.[14]

Dyson's complementarity idea is an interesting viewpoint. Borrowing an idea from Niels Bohr, he makes an analogy between the mutual relation of science and religion and the complementarity between the wave and particle natures of light and quantum objects, or between justice and mercy in ethics, form and substance in literature, or thought and feeling in psychology.[15] He insists that complementarity implies total separation, since in physics it is impossible to observe the two aspects simultaneously. However, I must note that a total disconnection between the two is neither necessary nor fruitful. Those who uphold

[10] Sagan, T*he varieties of scientific experience: A personal view of the search for God*, xi.

[11] Ian G. Barbour, *When Science Meets Religion* (San Francisco, CA: Harper, 2000).

[12] John F. Haught, *Science and religion: From conflict to conversation* (Mahwah, N.J.: Paulist Press, 1995).

[13] Freeman J. Dyson, *A many-colored glass: Reflections on the place of life in the universe* (Charlottesville: University of Virginia Press, 2007).

[14] John R. Staver, 'Skepticism, truth as coherence, and constructivist epistemology: grounds for resolving the discord between science and religion?', *Cultural Studies of Science Education* 5, no.1 (2010): 19-39.

[15] Dyson, *A many-colored glass: Reflections on the place of life in the universe*, 2007.

this kind of "independence" (as in Barbour's typology) justify it on grounds of the risk of getting the two fields muddled, such that one will not be able to do either rigorous science or serious religion. This risk is definite and must be watched for, but the solution is not necessarily total disjunction. Still, I think 'complementarity' can perhaps constitute a commonly useful concept for physics/science and religion.

Hard-line scientists, however, refuse any such 'fruitful' interaction but often argue that there is absolutely no need for religion at all, that science is—at least in principle—capable of inducting and ultimately fully explaining any realm of natural or human activity, a position often referred to as 'scientism', with a bad connotation. Conversely, religion sometimes trespasses its bounds into science's territory by presenting (usually through its scriptures, which are held sacred) descriptions and explanations of natural or human phenomena, topics which we now recognise to be the (sole) purview of science, and the latter often providing different explanations than the scriptures. If we are to have a healthy relationship between science and religion, neither should allow itself to invade the other's territory, and where there may be areas where both can say something (e.g. what is 'human'?), the dialog must be proper, with each side presenting what it alone can provide: facts and data from science, meaning and purpose from religion.

Whatever relation or interaction they may or may not have, physics and religion, it must be stressed, have different agendas and methods and speak to different parts of our minds. They use different concepts: 'truth(s)' vs. 'facts', theories vs. beliefs, models vs. organisations or hierarchies, etc. They do share some common vocabulary (e.g. laws and principles) and concepts (e.g. unicity, truth, etc.). Truth (small or capital T), although sometimes used by both, is a rather subjective concept in religion and a contentious one in science.[16] Indeed, when do we consider theories as 'true' and results as 'facts' in science?

Furthermore, science and religion have largely different methods. In physics, 'validation' (of results or theories) is done by using repeatable experiments and peer reviewing of any claim; in mathematics, and sometimes in philosophy, 'proofs' are demonstrated using verifiable rules of logic and previously established theorems and results. In

[16] Guessoum, 'Science, religion, and the quest for knowledge and truth: An Islamic perspective,' 2010.

religion, however, 'arguments' are adopted if they are accepted by the scholars (if they are 'convinced' by them), and they are often regarded as sufficient.

One way that religion and science find some commonality is in the usage of 'explanations' and 'interpretations' of texts (sacred or other, for religion), concepts (unicity, probabilities, randomness, etc.), and data (for science), models and theories (e.g. inflation, many-world quantum mechanics, etc.).

And finally, we should recognise some commonality between religion and science in that both adopt (at least in principle) an attitude of 'humility': we don't know for sure; only God knows; we must be ready to admit error; our results are tentative; etc.

A Proposed Conciliation or Harmonisation

From the above, we can conclude that there are a number of points of 'contact' and potential 'friction' between physics and religion/theology, from methodological naturalism to fundamental randomness (is quantum random fundamental/ontological in nature? did God deliberately build the universe on randomness?). However, we have also seen that physics/science and religion/theology are not necessarily in conflict: one may delineate the areas that each rules (proper, correct description of natural phenomena with laws and parameters vs. proposing existential explanations, meanings, etc.) and the different methods that each employs. The laws of the universe (or secondary causes in the language of medieval philosophers and theologians) could then be seen as 'proxies' for God, operating with regularity through his 'support'. This could indeed be God's subtle way of ruling over the universe.

Most religious people would declare that God did indeed set the world on a rational and ordered basis, making the world behave according to rules/laws and making these reachable and knowable to humans, otherwise he would be a malicious, vicious god. Does he then act in this world; does he then abide by those laws, or is he free to violate them? Two theological views then present themselves (and are adopted by various religious thinkers): either God acts within those rules/laws, perhaps taking advantage of quantum and other bewildering features of

the natural world, or he acts overtly and suspends/violates the laws that he himself had set for the world. The contemporary Muslim theologian Aref Ali Nayed has remarked that although it is true that God is totally free to decide as he wills, this does not mean that He grants Himself unreasonable freedom. After all, he has stated in the Qur'an that 'He has ordained mercy on Himself" (Qur'an 6:12), the key word being 'ordained'. I may add that in a famous *hadith qudsi* (a non-Qur'anic divine pronouncement) He tells humans: 'I have prohibited injustice on Myself.' By analogy, Nayed concludes: 'Reason need not be above God and externally normative to Him. It can be a grace of God that is normative because of God's own free commitment to acting consistently with it.'[17]

My view is that physics and science must be considered neutral and independent of theology and religion; they have their own (naturalistic) methodology, which allows them to establish results with objective and universal standards as much as feasible. However, religious believers may add a theistic 'envelope' both without loss of rigor and with gains in meaning, ethic, and general worldview. To paraphrase Dyson, science and religion can avoid conflict and be positive engines in humanity's growth if science can accept to give up its imperialistic dreams and if religion can accept to be less 'dogmatic' and more open to contributions from other fields of knowledge (science, arts, etc.).

To close this section, I may recall how Carl Sagan insisted that science's rigorous methodology forces us to remain honest against our tendencies to deceive ourselves; this he referred to as 'the height of spiritual discipline'[18]. In the same mutually respectful and enriching vein, Dyson quotes the novelist Madeleine L'Engle: "When I try to find twenty-first century mystics, to help me in my own search for meditation and contemplation, I turn to the cellular biologists and astrophysicists, for they are dealing with the nature of being itself, and their questions are theological ones: What is the nature of time? of creation? of life?'[19]

[17] Aref Ali Nayed, 'A Muslim's commentary on Benedict XVI's Regensburg lecture', *Islamica Magazine*, 18(2006): 46–54; 51.
[18] Sagan, *The varieties of scientific experience: A personal view of the search for God*, xi.
[19] Dyson, *A many-colored glass: Reflections on the place of life in the universe*, 144.

Summary and Conclusion

To sum up and conclude, I must stress that it is first important to clearly understand the different natures and domains of action of physics/science and religion.

Physics/science and religion have two largely different purviews. The first aims to describe/explain natural phenomena, how they happen, under which conditions and laws, what those imply; etc. The second proposes existential explanations: why are we here, why is there a universe, where did it come from, do phenomena and events have any meaning or is the whole thing 'pointless', etc. In his 'reflections' book, Freeman Dyson describes religion as 'an essential part of the human condition, more deeply rooted and more widely shared than science.[20]

However, confusions and trespasses sometimes occur when science and religion attempt to address questions that are not part of their domains; for example, scientists insisting that there is no God, or theologians insisting that humans did not evolve from lower-level species, and such. The first principle that one must insist on is the importance of respecting each other's purviews.

The second idea that I tried to bring out and highlight is the possibility and benefit of dialogue and complementarity between the two spheres, while still insisting on the proper conditions that must be upheld, namely that the fundamental mechanisms of science must not be corrupted or even negotiated and that the dialogue must be positive, constructive, and intending to be mutually enriching.

One such area of dialogue and complementarity is 'randomness', which is widespread and diverse in the universe and takes two different forms: fundamental (the quantum type) and epistemic (due to our limited capabilities in measuring and specifying parameters). Interestingly, randomness is found to be not without some underlying order or probabilistic-statistical pattern. Indeed, randomness not only follows simple, elegant laws and produces beautiful order, but in fact was necessary for differentials to occur in nature and varieties to emerge. Without quantum fluctuations, the universe would have been utterly homogeneous, and complex structures (galaxies, stars, planets, etc.)

[20] Dyson, *A many-colored glass: Reflections on the place of life in the universe*, 131.

would not have formed. This brings up a very interesting discussion about this relates to God, the creator of the universe.

In earlier times, randomness used to be thought of as God's way of hiding his plans, and many cultures practiced cleromancy, casting lots by throwing dice or bones with symbols to try to 'uncover' divine plans or get divine hints. More recently, and with the realisation that randomness plays important roles in various areas, from cosmology to biology, a number of authors have insisted that randomness strongly conflicts with divine providence. For instance, Robert Charles Sproul wrote: 'The mere existence of chance is enough to rip God from his cosmic throne. … If chance exists in its frailest possible form, God is finished.'[21] Similarly, Benedikt Paul Göcke, reviewing randomness in cosmology and biology formulated an 'Argument [against the existence of God] from Chance and Randomness': 'If there is a random state of affairs in the universe, then God does not know that his providential plans are fulfilled.'[22]

But this antagonism and conflict are not a necessary, logical outcome of the existence of randomness in the universe. First, as I have noted, complexity and richness of the natural world would not have been possible without randomness, or at least the latter made the former possible. Furthermore, we have found some mathematical order underlying randomness; could God's plan be built on probabilities and statistics? Furthermore, some have argued that true randomness, as we have learned from computer science, is beyond humans' capabilities (our random number generators are actually based on deterministic formulas or algorithms), and if true randomness really exists in the world, then it actually points to an 'infinite mind'. In an essay titled 'God is Random: A Novel Argument for the Existence of God', Serkan Zorba writes: 'I will propound the idea that the epistemic cost of unpredictable randomness is infinite intelligence, and thereby present a new a posteriori argument for the existence of God from the irreducible randomness of the quantum world.'[23]

[21] R. C. Sproul, *Not a Chance: The Myth of Chance in Modern Science and Cosmology* (Grand Rapids: Baker Books, 1994).

[22] B. P. Göcke, 'Did god know it? God's relation to a world of chance and randomness', *International Journal for Philosophy of Religion* 78 (2015): 233–254.

[23] Serkan Zorba, 'God is Random: A Novel Argument for the Existence of God' *European Journal of Science and Theology* 12, no.1 (2016): 51-67; 51.

To conclude, a harmonious, complementary relationship is possible between physics/science and religion, provided that physicists/scientists resist reductionism and scientism and the claim that science—and only science—can answer all questions pertaining to the world, the cosmos, and existence, and provided that religious thinkers tone down dogmatic and imperialistic tendencies (claims that religion applies to all areas of life and knowledge).

Structures of time in Byzantine philosophy

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The article analyzes the interpretation of the nature of time according to the view of Byzantine philosophers, highlighting its receptive distance from the Hellenic tradition and its significant divergence from Western Christian philosophy, as well as from the Descartes-Newtonian concept of time. The definition of time that forms the core of Byzantine philosophical thought on the temporal and trans-temporal dimensions of being was coined by Basil the Great: time is an interval (or extension - *διάστημα*) coextensive with the existence of the cosmos. Crucially, time is not necessarily tied to motion, there is no causal connection between time and movement. Time and aeon, with all the differences between them, are diastemic, but eternity is not. However, they are not simply parallel and distinct, but genetically related. The beginning (*ἀρχή*) of time itself has an adiastemic character. It includes in itself significant properties of the aeonic and the eternal. The dynamic interaction of time, aeon and eternity is still found in Jesus Christ himself and in the topoi of the divine actions in the world. Time, aeon and eternity form a network in which they work and are together in a common dynamic. It is the network of world history which will be removed only after the end of the world.

In posing the question of the interpretation of the nature of time according to the view of the Byzantine philosophers, it should be noted that they determined themselves as Christian philosophers.[1] Their pre-predicative basis is the Christian worldview. Their concepts of time, however, differ in significant ways from the understanding of Western Christian philosophy and already decidedly from the Descartes-Newtonian concept of time. I am inclined to believe that the Byzantine

[1] Cf. Clemens Alexandrinus, Stromateis, VI, 8, 67, in *Clementis Alexandrini Opera*, vol. III, ed. D. Wilhelm, Oxford, 1869, 177,16; Gregorius Nyssenus, *De vita sancti Gregorii Thaumaturgi*, in: PG 46, 905C; Maximus Confessor, *Mystagogia*, 5, in PG 91, 673B. Already Paul actually writes about a *φιλοσοφία κατὰ Χριστὸν*, which is opposed to *the φιλοσοφία κατὰ τὴν παράδοσιν τῶν ἀνθρώπων, κατὰ τὰ στοιχεῖα τοῦ κόσμου* - Colossians 2. 8.

view is able to enter into an analogical isomorphism[2] with the time understanding of quantum mechanics. I have my reasons to think that this view can be helpful for the present scientific and everyday searches to form a more adequate understanding of time.

The definition of time that forms the thought of the Byzantine philosophers about the temporal and trans-temporal dimensions of being was coined by Basil the Great: *Χρόνος δέ ἐστι τὸ συμπαρεκτεινόμενον τῇ συστάσει τοῦ κόσμου διάστημα* – time is the interval coextensive with the existence of the cosmos.[3] This definition both draws on and distances itself from a massive Hellenic tradition.

1. The Hellenic Tradition

First and foremost is Plato's concept unfolded in *Timaeus* 37c-39e. According to Plato, time begins with the formation of the world. He associates time with movement and relates it to the movement of the seven 'wandering' stars: time began when the heavens, i.e. the seven stars, were formed.[4] Plato's proposition that time began to exist with the creation of the cosmos was inevitably followed by the Christian authors. Plato problematises time in the perspective of becoming (*γένεσις*) with its impermanent character. Therefore he tries to grasp time from the perspective of 'eternity' (*αἰών*): Time is a moving image (εἰκών) of eternity,[5] which is postulated as a motionless paradigm of the happening, the becoming in the course of time. It should be noted that Plato uses *αἰώνιος* and *ἄϊδιος* synonymously in describing the intelligible.

Aristotle also considers time as something that inevitably belongs to movement without being movement itself.[6] Time is determined as a number of movement (*ἀριθμὸς κινήσεως*), and it is what is counted, not that with which we count.[7] Time is a measure of motion and of being moved.[8] Aristotle points out that time cannot be associated with

[2] Cf. Stoyan Tanev, *Energy in Orthodox Theology & Physics*. From Controversy to Encounter (Eugene, Oregon: Wipf & Stock, 2017) 89.
[3] Basilius Magnus, *Contra Eunomium* 1, 21, in PG 29, 560B.
[4] *Tim*. 37e1-3; 38b6-7; 38c3-6; 38e4-5.
[5] *Tim*. 37d7-e1.
[6] *Phys*. 4.11, 219a9-10.
[7] *Phys*. 4.11, 219b1-8.
[8] *Phys*. 4.12, 220b32-221a1.

a particular movement since 'time is present equally everywhere and with all things'. Furthermore, movements have speed, that is, they can be fast or slow, whereas time does not. In addition, fast and slow are defined by time.[9] The 'now' (*νῦν*) is like the unit (*μονάς*) of number. Time is both made continuous by the 'now' and divided by it.[10] Hence time is not a number in the sense in which there is a number of the same point because it has a beginning and ends, but rather as the extremities of a line form a number, and not as the parts of the line.[11] The 'now' is the boundary of the past and the future. For we say 'before' and 'after' with reference to the distance from the 'now'. The 'before' and the 'after' are within time, because the 'now' is within time.[12] Therefore the 'now' is not a part of time. As a boundary it is not time, but an attribute of it (*συμβέβηκεν*). The 'now' is a number only insofar as it computes (*ἀριθμεῖ*).[13] So 'before' and 'after' are in time, they are time because they are calculable.[14] Aristotle asks the question: If soul did not exist would time exist or not?[15]

Both the Platonic and Aristotelian views of time were questioned early enough. As late as the beginning of the 3rd century BC, Zeno of Kition stipulated that time was not a *ἀριθμός* or *μέτρον*, but a *διάστημα*. According to him, the term 'extension' better expressed the idea of continuity in the temporal and spatial plan. Time was determined as 'extension of motion' (*κινήσεως διάστημα*). Zenon also pointed out the difference between different διαστήματα, which were produced by beings moving with different speeds between two points. His concept was further developed by Chrysippus of Soloi, who also applied it to the motion of the universe. A διάστημα expresses the movement of a body between two points, but time does not stop with it. Therefore Chrysippus speaks about a twofold character of time: the movement of a body between the points A and B is only a segment of the whole course of time.[16] At the same time he postulates an equation between

[9] Cf. Mark DelCogliano, Basil of Caesarea versus Eunomius of Cyzicus on the Nature of Time: A Patristic Reception of the Critique of Plato, in *Vigiliae Christianae*, 68 (2014), 509. Cf. Phys. 4.10, 218b13-18.

[10] *Phys*. 4.11, 220a4-6.

[11] *Phys*. 4.11, 220a15-18.

[12] *Phys*. 4.14, 223a4-8.

[13] *Phys*. 4.11, 220a21-22.

[14] *Phys*. 4.14, 223a28-29.

[15] *Phys*. 4.14, 223a21-28.

[16] Three main representative definitions of Chrysipus are: 'the extension of the movement

space and time. They are two infinite extensions or protractions in the void-*κενόν*, one spreading in three dimensions, the other infinitely in the past and in the future. That is why he does not talk about a unit of time or indivisible now (*νῦν ἀμερὲς*), because time is considered as a non-interruptible, continuous stream, infinitely divisible. Chrysippus, however, emphasises that time does not exist in its entirety, but only as a now, due to which the past and the future are present.[17] The Stoics took a 'less subjectivist' view in speaking of time not as something countable or counted by someone conscious by counting but as merely depending on the existence of movement.[18]

Philo of Alexandria, for example, adopts the definition of time as protraction, interval or extension (*διάστημα*) of the motion of the cosmos. With the term *αἰών* he designates at the same time the life span of the intelligible world. Clement of Alexandria, following him, will use the term *ἀδιάστατον* only in reference to God, meaning 'without division' or 'without dimension,' or perhaps both.[19] Alcinous, who lived in the second century AD and is considered a Middle Platonist, emphasised that God created time as an extension to the movement of the cosmos (*τῆς κινήσεως τοῦ κόσμου διάστημα*), as an image of eternity, which is the measure of the stability of the eternal cosmos. For his part, Galen criticised the Aristotelian definition of time and, moreover, postulated that the existence of time is completely independent of motion.[20] Especially significant in our context are Plotinus' reflections on time.

He begins with the sharp distinction between everlastingness (*αἰών*) and time (*χρόνος*): The *αἰών* refers to the nature that is everlasting (*περὶ τὴν ἀίδιον εἶναι*) and time to what comes to be with this universe.[21]

of the cosmos' (*διάστημα τῆς τοῦ κόσμου κινήσεως*) 'the extension accompanying the movement of the cosmos' (*τὸ παρακολουθοῦν διάστημα τῇ τοῦ κόσμου κινήσει*) and 'the extension of movement according to which one speaks of the measure of fastness and slowness' (*κινήσεως διάστημα καθ' ὅ ποτὲ λέγεται μέτρον τάχους τε καὶ βραδυτῆτος*) – cf. DelCogliano, Basil of Caesarea versus Eunomius of Cyzicus on the Nature of Time: A Patristic Reception of the Critique of Plato, in: *Vigiliae Christianae*, 68 (2014), 516.

[17] Владимир Цветковић, *Бог и време. Ученье о времену Светог Григорија Ниског,* Ниш: Центар за црквене студије, 2013, 216-226.

[18] DelCogliano, Basil of Caesarea versus Eunomius of Cyzicus on the Nature of Time: A Patristic Reception of the Critique of Plato, 516.

[19] David Bradshaw, Time and Eternity in the Greek Fathers, in *The Thomist* 70 (2006), 327-328 et 331.

[20] DelCogliano, 'Basil of Caesarea versus Eunomius of Cyzicus on the Nature of Time: A Patristic Reception of the Critique of Plato', 514-515 et 519.

[21] Plotinus, *Enneades*, 3, 7, 1. English translation: Plotinus, *The Enneads*, Cambridge: Cambridge University Press 2018.

With regard to the idiosyncrasy of time, he speaks unequivocally: The movement can be interrupted and brought to a halt, but the time cannot be: time is continuous.[22] Plotinus describes its nature as extension/ *διάστημα*, which unfolds through changes and acitivities.[23] Time itself is not a measure. It is the one being measured. It is not really the measure of the movement, but only accidentally. Time is not a measure of itself. The measurer is a certain 'I'. Plotinus asks directly: Who is actually this I? It is that in accordance with which the measuring takes place. Time is not actually a measure.[24] Plotinus is in solidarity with Plato that time is neither measuring nor being measured by something and repeats his thesis that it came to be simultaneously with heaven with eternity as its model and as an image that is moving. It is thereby a moving image, because time does not rest if the soul does not rest. The being of time is associated with the world soul. Time is everywhere in the visible world because soul has removed itself from no part of the universe, just as the soul in us has not removed itself from any part of us. Time is also in us. It is in all souls of the appropriate kind and in an equal manner in each soul, and all souls are one. For this reason, time is not scattered apart; for neither is eternity which is present in another manner in all things of the same kind.[25]

Plotinus expresses himself extensively about everlastingness. He calls the whole intelligible cosmos everlasting (*αἰώνιος*) and eternal (*ἀίδιος*) and asks himself is it identical with eternity-*ἀιδιότης* or does eternity depend on everlastingness.[26] He does not answer the question. In any case, in several places[27] he calls the intellect/*νοῦς* both aeonic (*αἰώνιος*) and eternal (*ἀίδιος*). The αἰών is a unitary nature that exists without extension (*ἀδιαστάτος*),[28] but is at the same time a complex of forces and multiples (*μὶαν μὲν οὖσαν, πολλὰ δὲ δυναμένην καὶ πολλὰ οὖσαν*). Plotinus names essence, motion, stability, difference, and identity, emphasising the inexhaustibility of activity (*τῆς ἐνεργείας τὸ ἄπαυστον*), the stability and the constant lack of extension. Plotinus determines the forces summarised in One (*εἰς ἕν*) – as it is typical for

[22] Cf. Ibid., 3, 7, 8.
[23] Ibid., 3, 7, 12.
[24] Ibid., 3, 7, 12.
[25] Ibid., 3, 7, 13.
[26] Ibid., 3, 7, 3.
[27] E.g., ibid., 2, 4, 3; 3, 1, 1; 3, 5, 7; 5, 1, 4; 5, 1, 9.
[28] Ibid., 3, 7, 2.

the Hellenic tradition – by the term 'life'. He defines the *αἰών* as life abiding forever in the identical state and possessing everything in its presence, not now this, again something else, but all at once, and not now some things, now others, but a partless perfection. It is just as in a point where all things are together and none of them ever flows forth but remains in dentity in itself and never changes, being always in the present because nothing of it has slipped away or again will come to be, but what it is is what it is. So, *αἰών* is not the substrate but that which, in a way, shines forth from the substrate itself due to the identity which it proclaims consisting in the fact that it is not going to be but already is, that it is so and not otherwise. The *αἰών* is the life which belongs to Being in its essence, all together, full, and completely without extension.[29]

2. Basil the Great. The Cappadocians.

Confronted with this background, Basil the Great develops the first systematic conceptualisation of time in Christian culture. Already in the fifth paragraph of the First Homily on the Hexaemeron he presents the basic lines of his view: 'It appears, indeed, that even before this world an order of things existed of which our mind can form an idea… The birth of the world was preceded by a condition (*κατάστασις*) of things suitable for the exercise of supercosmic powers (*τῆς ὑπερκοσμίοις δυνάμεσι πρέποσα*), outstripping the limits of time, everlasting and eternal (*ἡ ὑπέρχρονος, ἡ αἰωνία ἡ ἀΐδιος*). The Creator and Demiurge of the universe perfected His works in it, spiritual light for the happiness of all who love the Lord, intellectual and invisible natures, all the orderly arrangement of pure intelligences who are beyond the reach of our mind and of whom we cannot even discover the names'.[30] The three dimensions are already mentioned: time, everlastingness and eternity.

Reflecting on the nature and existence of time, Basil connects the succession of time (*τοῦ χρόνου διέξοδος*) with the addition to the existing of the visible cosmos – a home for beings destined to be born and to die. The nature of this succession is analogous to the nature of the world. Time is ever pressing on and passing away and never stopping in its course. Is not this the nature of time, where the past is no more, the

[29] Ibid., 3, 7, 3.
[30] Basilius Magnus, *Homiliae IX in Hexaemeron*, 1, 5, in PG 29, 15A.

future does not exist, and the present escapes before being recognised? Its nature is in accord with beings subject to change.[31]

Basil poses the question about the beginning of time, about the beginning of the world, that point where time's first movement originated. After discussing a wide range of meanings of the term '*ἀρχή*', he postulates that creation occurred rapidly and in no time. It is therefore said 'In the beginning created' because the beginning is something indivisible and instantaneous. It is *ἀδιάστατος* – without extension. 'The beginning of the road is not yet the road, and that of the house is not yet the house; so the beginning of time is not yet time and not even the least particle of it. If some objector tells us that the beginning is a time, he ought then, as he knows well, to submit it to the division of time – a beginning, a middle and an end. Now it is ridiculous to imagine a beginning of the beginning. Furthermore, if we divide the beginning into two, we make two instead of one, or rather make several, we really make an infinity, for all that which is divided is divisible to the infinite. Thus then, if it is said, 'In the beginning God created,' it is to teach us that at the will of God the world arose in less than an instant'.[32]

The beginning of time is a very special node. That which principles the time is timeless in principle. It borders on the aeon of the intelligent world and thereby corresponds with it. The beginning of time, after all, is not aeonic according to its character. It is *ἀδιάστατος*. But only eternity lacks an extension. The nature of the *ἀρχή* of time thus raises in itself essential features of the aeonic and the eternal, in that this *ἀρχή* is exactly the beginning of time. It is a metaphysical nucleus that initiates the physical along with its history and acts within it.

The world created from nothing was non created in time, the world is created with time.[33] Already in Athanasius of Alexandria, in his second discourse against the Arians, it can be read that the world has a diastemic beginning of its being (*διαστηματικὴν ἀρχὴν τοῦ εἶναι ἔχει*). The theme is further unfolded by Basil. He defines time as a *διάστημα* coextensive with the existence of the cosmos: 'Rather, time is the extension coextensive with the existence of the cosmos

[31] Ibid., 15B.
[32] Ibid., 17A.
[33] Tanev, *Energy in Orthodox Theology & Physics. From Controversy to Encounter*, 141.

(*συμπαρεκτεινόμενον τῇ συστάσει τοῦ κόσμου διάστημα*). All motion is measured by time, whether of the stars, of living creatures, or of anything else that moves. On the basis of time we say that one thing is quicker or slower than another. The quicker is what traverses a longer interval (*διάστημα*) in less time; the slower is what moves a shorter interval in more time'[34] Time is thus coextensive with the existence of every mode of created being. The *διάστημα* is constitutive to both time and everlastingness (*αἰών*).[35]

The term '*διάστημα*' – interval, extension – is used in respect of spatial as well as temporal relations. In the second case, it generally fixes the interval or distance between two points in time and is indivisibly connected with the time-*χρόνος* or with the course of time. Eastern Orthodox Christian thinkers speak of both horizontal and vertical *διάστημα* in terms of time and the aeon. While the course of man in the world and the course of the world itself are within the scope of the horizontal, the ascent – both of the human soul and of the angels – to God – is identified with the vertical διάστημα.[36]

The review of the quoted passage testifies to another specificity of Basil's concept of time. In the considerations about the 'faster and slower' and the measurement of the movement by the time an approximation to the argumentation of Galen and other authors can be observed that the existence of the time is not necessarily connected to the movement of the objects, including the celestial bodies. There is no causal connection between time and movement at all. Time is not identified with movement and not the movement makes its existence possible, but the movements – with their quickness or slowness – are measured by time. Time is their measure. For Basil, the existence of time does not depend on the existence of movement, but on the existence of the cosmos. Time is not dependent on the things that God has created, but on God himself.[37] When God instituted the nature of time, He gave

[34] Basilius Magnus, *Contra Eunomium*, 1.21, in PG 29, 560B: '*Χρόνος δέ ἐστι τὸ συμπαρεκτεινόμενον τῇ συστάσει τοῦ κόσμου διάστημα· ᾧ πᾶσα παραμετρεῖται κίνησις, εἴτε ἀστέρων, εἴτε ζώων, εἴτε οὑτινοσοῦν τῶν κινουμένων, καθὸ λέγομεν ταχύτερον ἢ βραδύτερον ἕτερον ἑτέρου· ταχύτερον μὲν τὸ ἐν ἐλάττονι χρόνῳ πλεῖον διάστημα μεταβαῖνον, βραδύτερον δὲ τὸ ἔλαττον ἐν πλείονι χρόνῳ κινούμενον.*' Cf. Ibid 2.13, PG 29, 593C.

[35] Bradshaw, Time and Eternity in the Greek Fathers, 336-337; DelCogliano, 'Basil of Caesarea versus Eunomius of Cyzicus on the Nature of Time: A Patristic Reception of the Critique of Plato', 525.

[36] Цветковић, *Бог и време. Ученье о времену Светог Григорија Ниског*, 207 and 215.

[37] DelCogliano, 'Basil of Caesarea versus Eunomius of Cyzicus on the Nature of Time: A

as measures and signs the intervals of days.[38] The time is measured by the weeks: the week counts up the movement of the time. The week is always repeated (*ἀεί*) according to the figure (*σχῆμα*) of the circle. The same can be said about the αἰών, adds Basil – it returns within itself and never ends.[39]

Therefore he did not call the beginning of the time the first, Basil continues, but a day, so that it had already in the naming the relationship with the everlasting (*τὸ συγγενὲς ἔχῃ πρὸς τὸν αἰῶνα*). 'It was, in reality, fit and natural to call 'one' the day whose character is to be one wholly separated (*μοναχοῦ*) and isolated from all the others. If the Scripture speaks to us of many ages (*αἰῶνες*), saying everywhere, 'age of age, and ages of ages,' (*αἰῶνα αἰῶνος, αἰῶνας αἰώνων*) we do not see it enumerate them as first, second, and third. It follows that we are hereby shown not so much limits, ends and succession of ages, as distinctions between various states and modes of action.'[40]

Basil's notion of the 'extension' of the existence means in the first place the interval from the beginning of the creation to its end. It characterises the radical bifurcation of the divine and the created orders of existence.[41] It applies to the aeon as well. Because created, the aeon is limited by its beginning. Therefore it is not to be called 'eternity', although it is infinite and not temporal. Basil understands eternity as lack of limit. As an aeon, he describes above all the state older than the creation of the world, the kingdom of the angels. The angelic powers are infinite because they have God not only for their beginning, but also for their end. And God is infinite. The angelic kingdom is called by Basil both *αἰώνιος* and *ἀΐδιος*.[42] Rather, this marking is self-evident. In this kingdom (the 'paradise') as well as in the kingdom of God any everlasting being and God himself co-exist. In itself, however, the invisible and noetic world belongs to the creation just like the visible world. Aeonian

Patristic Reception of the Critique of Plato', 522-526 et 530.

[38] Basilius Magnus, *Homiliae IX in Hexaemeron*, 2, 8, in PG 29, 49C: '*ὁ τὴν τοῦ χρόνου φύσιν κατασκευάσας Θεὸς, μέτρα αὐτῷ καὶ σημεῖα τὰ τῶν ἡμερῶν ἐπέβαλε διαστήματα*'.

[39] Basilius Magnus, *Homiliae IX in Hexaemeron*, 2, 8, in PG 29, 49C.

[40] Basilius Magnus, *Homiliae IX in Hexaemeron*, 2, 8, in PG 29, 49CD.

[41] DelCogliano, 'Basil of Caesarea versus Eunomius of Cyzicus on the Nature of Time: A Patristic Reception of the Critique of Plato', 529.

[42] Цветковић, *Бог и време. Ученье о времену Светог Григорија Ниског*, 151-152.

is also the 'eighth day' which is without evening, without succession and without end (*ἀνέσπερος καὶ ἀδιάδοχος καὶ ἀτελεύτητος*).[43]

John of Damascus presents several meanings of 'aeon,' keeping valid Basil's instructive proposition that it is a matter of different states and relations, but not of sequences, constellations, implications, or mutual sublations. In everyday language, what is meant by aeon is the life of the individual. It is also called the time of a thousand years, as well as the entire present life. Moreover, it is spoken about seven *αἰῶνες* of this world – from the creation of heaven and earth to the common end and resurrection of people. So is also called the eighth day, that is, the future infinite life after the resurrection. Aeon is also called the state before the creation of the sun, when it was not a measurable aeon, but something that is describable by a quasi-temporal movement and extension. Aeon is admittedly also it, which runs at the same time with the eternal like a temporal mobility and extension (*οἷόν τι χρονικόν κίνημα καὶ διάστημα*). Therefore, God is also called *αἰώνιος*. But he is also called *προαιώνιος* because he created the αἰών itself. [44]

God is called *πρὸ αἰῶνος* – 'existing before the ages'. God stands above and before all aeons and dwells in eternity (*ἀιδιότης*). Eternal is also the community-*κοινωνία* of the divine persons, and they mutually unite without any extension (*ἀδιαστάτως*): their being together is not delimited by any mediator (*μηδενὶ μέσῳ*). God has not appeared from non-being into being.[45] As *ἀδιαστάτος*, God is distinct from all – temporal and aeonic – creatures. Therefore, eternity par excellence is not rewritten by diastemic – temporal or aeonic – terms or predicates. It is rather stated as existence or life of a special kind.

The description, coined by John of Scythopolis in the 6th century entirely in the spirit of the Cappadocians, states that the eternity of the Creator of the aeons is an infinite life, present in its wholeness, and nothing of it disappears into the past, but it lingers and emerges immovable and unchanging as a unity. This life emerges outwardly (*προεστῶσαν*). That is why the actually *ἀΐδιος* God is also called *αἰών*, because the aeons – the sphere of the noetic and invisible –are created by him. The Aeonian participates in the nondiastemic and infinite life.

[43] Basilius Magnus, *Homiliae IX in Hexaemeron*, 2, 8, in PG 29, 52A.
[44] Iohannes Damascenus, *Expositio accurata fidei orthodoxae*, 2, 1, in: PG 94, 861A-864C.
[45] Basilius Magnus, *Contra Eunomium*, 2.12, in: PG 29, 593BC.

God, the Timeless, *ὁ ἄχρονος*, is also called time-*χρόνος* because He is the one causing time. What the aeon is to the noetic, time is to the things of the senses. Time also rested in the Eternal Being and was uttered *καθ' ὑπόβασιν* – according to going downwards, when the visible nature was to appear. 'Time' is called the procession-*πρόοδος* of the divine goodness-*ἀγαθότης* into the visible things at their creation. The movement of divisions (*διαστάσεις*) of segments, hours, days, and nights, on the other hand, is not time, but something homonymous with time. The Arranger (*διατάξας*) and Causer of the aeons and of time dwells super-aeonically and timelessly. About him one must not say 'he was', 'is' or 'will be' – he is above all that. His being is super-being, transcendent to being – *ὑπερουσίως*.[46]

The foundations of these definitions, laid in the 4th century, are common to the Cappadocians. Gregory the Theologian mentions as characteristics of the divine accessible to our imagination the lack of limit and end and the beginninglessness (*τὸ ἄπειρον καὶ ἀνέκβατον, ἄναρχον*). The immortality and the imperishability are indeed typical to it and to the aeon. The aeon is neither time nor part of time and it cannot be measured. But for it a mobility similar to the temporal one, as well as the extension (*οἷόν τι χρονικὸν κίνημα καὶ διάστημα*) are characteristic. The everlasting and the temporal are present in the realm of economy and not theology.[47]

Gregory of Nyssa never describes eternity by the word '*αἰών*'. God is beginningless and endless, that is, timeless (*ἀχρόνως*), and He is the eternity of the aeon (*τῶν αἰώνων ἀΐδιότης*). God is *ἀδιάστατος*. 'Extension' (*διάστημα*) is the characteristic common to time and the aeon. Gregory goes as far as to say that '*διάστημα* is nothing other than the creation itself'. The aeon is limited by a *διάστημα* that extends with it: the aeon has its beginning and its limit – *πέρας*. By the term '*διάστημα*' the difference is drawn between created and uncreated. The *διάστημα* in the realm of the physical is principally different from the *διάστημα* belonging to the aeon. On the eighth day, the physical

[46] Glossa ad De divinis nominibus, l. 5, c. 4, in: PG 4, 313D-316AC. Cf. David Bradshaw, Divine Freedom: The Greek Fathers and the Modern Debate, in: *Philosophical theology and the Christian traditions : Russian and Western perspectives*, ed. David Bradshaw, (Washington: The Council for Research in Values and Philosophy, 2012), 90-92.

[47] Gregorius Theologus, Orationes, 38, 8, in PG 36, 320AB. Cf. Bradshaw, Time and Eternity in the Greek Fathers, 338; 'DelCogliano, Basil of Caesarea versus Eunomius of Cyzicus on the Nature of Time: A Patristic Reception of the Critique of Plato', 523.

διάστημα, the horizontal, fails; in contrast, the vertical, the spiritual, remains present.[48] The physical or natural διάστημα is an ontological gulf between the Creator and us. In this world we are separated from God by the temporal extension. Everything that exists in time is created and has a place in the temporal order. It is related either to the beginning of time, or to other temporal beings and events, or to the end of time and the second coming of Christ.[49]

The Cappadocians formulated the crucial points of the Byzantine understanding of time. The divisive term is the extension-*διάστημα*. It separates the two major spheres: God is not diastemic and creation – the realm of the intelligible and the visible cosmos – is diastemic. The divine eternity, which is around God – God is eternity and at the same time he transcends eternity (for this reason creatures could actually participate in eternity)[50], is attainable by humans only by means of their imagination. The realm of the extensive, on the other hand, is recognisable, whereby time and the aeon have no causal relationship with movement. They are conditioned by the existence of the creation.[51]

3. Maximus the Confessor

Also, for Maximus the Confessor the availability or the lack of *διάστημα* is the decisive criterion for the distinction between the everlasting and temporal on the one hand and eternity on the other. The marvellous greatness of the divine infinity, the *θεία ἀπειρία*, is something that has not quantity, is indivisible, and completely nonextensive (*παντελῶς ἀδιάστατον*). The unknowability of the divine essence is also based on this. Truth is being God around whom the intellect-*νοῦς* moves ceaselessly and not forgetting (*ἀλήστως*) without being able to stop its movement, because there is no limit to be found

[48] Цветковић, *Бог и време. Ученье о времену Светог Григорија Нискоr*, 241-262. Cf. Bradshaw, Time and Eternity in the Greek Fathers, in The Thomist 70 (2006), 335-336.

[49] Vladimir Cvetkovic, St Gregory's argument concerning the lack of διάστημα in the divine activities from Ad Ablabium, in: Gregory of Nyssa: the minor treatises on trinitarian theology and Apollinarism, eds. Volker Henning Drecoll, Margitta Berghau, (Leiden and Boston: Brill, 2011), 373.

[50] Cf. Bradshaw, Time and Eternity in the Greek Fathers, 320-321 et 353.

[51] Cf. Bradshaw, Time and Eternity in the Greek Fathers, 341-342; Brandon Gallaher, 'Chalice of Eternity: An Orthodox Theology of Time' in *St Vladimir's Theological Quarterly* 57, 1 (2013), 14; Georges Florovsky, Creation and Creaturehood, in *The Collected Works of Georges Florovsky*, Vol. III: Creation and Redemption (Belmont: Massachusetts, 1976), 43.

where there is no extension (*μὴ εὑρίσκων πέρας ἔνθα μὴ ἔστι διάστημα*). In no way is it possible to comprehend the limit of something that has no *διάστημα*.[52] The eternal God, the Creator of the aeons and times, fills everything with His eternal light (*φῶς ἀΐδιος*) through the rays of His goodness.[53] Everything created by God, i.e. the nature of beings and time (*ἡ φύσις τῶν ὄντων καὶ τὸν χρόνον*), when God appears in any form, shows itself together with him because He is its cause and creator.[54]

At the same time Maximus decisively distinguishes between eternity and the aeon. Eternity remains quite indifferent to everything diastemic – the everlasting and the temporal. In contrast, he sees the kinship between the last two. Time becomes aeon when movement stops, and the aeon becomes time when it is measured as carried by the movement; his 'eternity' is by no means identified with the divine eternity or conceived in an analogy with it. The definition of Maximus is: 'The aeon is time deprived of motion, whereas time is the aeon measured by motion'.[55]

The aeon as meant in this definition is the whole of the time-duration of the creation, the whole time volume in which the created being is present. It is the totality of time and in this sense the 'eternity' of times, in which they are all simultaneously enclosed and therefore immovable. This 'eternity' is identical with the common history of the created world in its existence between the point of its creation and its end, conceived in its total unity. This aeon is the integral quantitative and qualitative concentration of time.

Reflecting on the created beings and the aeons in general, Maximus notes that they are moving and circumscribable, being determined by the principle/*λόγος* of quiddity, quality and qualified being (*πῶς εἶναι*). Everything that moves and has been created has a beginning and is temporary in an absolute sense, although – accentuated Maximus – there is also such a time that is not measurable by the motion. The emphasis is on the time-conditioned existence. It is time in which the existent begins to be and it is an extension-διάστημα since it begins to

[52] Maximus Confessor, *Mystagogia*, in PG 91, 677A.

[53] Maximus Confessor, *Ambigua ad Johannem*, 46, in PG 91, 1357B; trans. Nicholas Constas in Maximos the Confessor, *The Ambigua*, Cambridge, Mass. – London 2014.

[54] Ibid., 10, 9, in PG 91, 1164A.

[55] Ibid., in PG 91, 1164C.

be. Everything that is and is in motion is subject to nature and time. But in one sense it is subject to time by the movement and in another sense by being – by its existence.[56]

In the second sense, first of all, the action of the natural or essential energies is meant. The presence and the intensity of the existence, i.e. the expression of the energies, unfold in time, but they are not movement in the general meaning of the word and they are actually not to be measured by the movement. Just reflecting on the relationship between movement and stasis, Maximus more sharply circumscribes the profile of 'movement' and draws the distinction between two modes: between 'movement' par excellence (*κίνησις*) and 'carrying' (*φορά*). Movement is specific to all that is subject to generation and corruption. In those, 'more' and 'less' can be noticed.

In contrast, the 'carrying' means the 'circling' of the essence, the 'motionless movement', which determines the being-structure of the thing. In it are constituted its nature, force and energy (*οὐσία, δύναμις, ἐνέργεια*), its unchanging order and sufficiency of being (*τάξις καὶ διαμονή*), as well as its unchanging natural properties. Indeed, the principles/λόγοι of things and their acting in the things are to be distinguished.[57] The activity of the completely unchangeable divine principles is varied in its own limits by virtue of the relative self-existence of the being. The unchangeable 'law of the natural' works in the dynamics of existence and therefore comes into relations with the movement. At least the non-measurability of the existential activity by the movement remains valid.

Time and movement, generally meant as change, stand in no necessary being-correspondence. The sensible and temporal things are created in matter. The material is given to Adam as mediator to look at the spiritual through his spiritual eye. But he remained in the realm of the material, which he separated from his spiritual core. Such material is decaying and perishable. By his detachment from God, Adam introduced death to himself and to his descendants. He himself has brought forward death 'for the whole time of the present temporal duration' (*κατὰ πάντα τὸν χρόνον τοῦ παρόντος καιροῦ*). Death lives in the course of the whole of this temporal extension (*ὁ θάνατος ζῇ δι'*

[56] Ibid., 67, in: PG 91, 1397AB.
[57] Ibid., 15, in: PG 91, 1216D-1217C.

ὅλου τοῦ χρονικοῦ τούτου διαστήματος). It lives permanently (*ἀεί*) – in the whole aeon of this world.[58] The time of the created cosmos is a historical time.

The aeon or the aeons of the intelligible natures also have their history. These beings are created, they have a beginning of their being, their duration has their διάστημα.[59] The historical time does not necessarily presuppose movement, it is not to be measured obligatorily by the movement. But it presupposes the unfolding of events, in which the modes of existence of the natures of the created beings can be changed or transformed. The interaction and interrelation between the constant principles of essences and the varying modes of existence of natures in the course of historical time are made possible thanks to the incarnate principle of principles.

Jesus Christ receives the whole being, the whole time and all aeons. But in him they are present in a completely different way than in their contingent existence. In him, the creator of those and their cause, they are present in eternity according to their logoi. Both the aeon and time are 'suspended' in their eternal logoi and therefore in the eternal divine Logos[60], who himself became man and thus a historical person. God is the eternity par excellence. Through the ray of his creative energy he introduces the non-being into being and sets the beginning of the lifetimes or the aeons, embracing and constituting the whole of their course and their end. The wholeness and the completion of all aeons is the completion of their history. But the cosmos is penetrated with it at the same time also by the natural divine energies, the own existence of God, the eternal light. The divine goodness given in this way fills the whole created cosmos with all its aeons. By this light also the worthy among the people, the deified in their existence, are filled. The 'limitedness' of God by means of the man in the God-man makes possible the analogical dwelling of the man as the representative of being and the figure of the time and the aeons.[61]

[58] Ibid., 10, 28, in: PG 91, 1156C-1157A.
[59] Ibid., 67, in: PG 91, 1397B.
[60] Ibid., 10, 9, in: PG 91, 1164AB.
[61] Ibid., 46, in: PG 91, 1357BC.

4. Michael Psellus

After the work on conceptualising time, as well as the aeonic and eternity, done by Greek-speaking Christian thinkers from the Cappadocians to Maximus the Confessor, their findings have been accepted as commonly valid. There are almost no attempts to doubt their determinations or to go beyond them. Symptomatic in this regard are the descriptive list of meanings of 'aeon' and the meager account of time and eternity in John of Damascus.[62] The same is valid for the systematic work of Gregorius Palamas. He devotes the first 29 chapters of his *150 chapters* to the description of the contingent world and the way of its knowledge. He is content to explain already in the first chapter that the world and time come into being together, as Moses recorded it.[63] The nature of time is not commented at all. Shortly after, it is noticed that the celestian bodies move perpetually (*ἀεί*) and the self-determined bodies (*ἀυθαίρετα*) move differently at different times.[64] Much later it is noted in a polemic on the divine energies, that God rules over creatures in time and aeon and over the aeons themselves (*ἐν χρόνῳ καὶ ἐν αἰῶνι καὶ αὐτῶν τῶν αἰώνων*) through his uncreated energy, which is distinct from his essence.[65] It is to be pointed out that the terms are used without any discussion of the peculiarity of the nature of time, aeon and eternity. The corresponding considerations of Michael Psellus are remarkable.

In his pseudo-pedagogical writing *De omnifaria doctrina* he regenerates the Aristotelian-Plotinian notion of time as a mental concept. Time is human thought, concept and name. Time is neither a self-existent thing (*πρᾶγμα*), nor a visible body, nor some disembodied hypostasis, but only a thing (*πρᾶγμα*) that exists only in thought. The philosophers, insists Psellus, have called time the measure of the motion of the beings arising and passing away under motion. These arising and passing away beings are contrasted with the perpetual beings (*αἰώνια*), whose being is everlasting (*ἀεί*) and immobile.[66] It is

[62] Iohannes Damascenus, *Expositio accurata fidei orthodoxae*, 2, 1, PG 94, 861A-864C; Dialectica, 55, in PG 94, 641C; *Expositio accurata fidei orthodoxae*, 2, 3, PG 94, 868B.

[63] Gregorius Palamas, *Capita 150*, 1, in: Gregory Palamas, *The One Hundred and Fifty Chapters*, ed. Robert Sinkewicz, (Toronto: Pontifical Institute of Mediaeval Studies, 1988), 82.

[64] Ibid., 3, 84.

[65] Ibid., 125, 228.

[66] Michael Psellus, De omnifaria doctrina, 102, *Michael Psellus. De omnifaria doctrina. Critical Text and Introduction*, ed. Leendert Gerrit Westerink, (Nijmegen: Centrale Drukkerij 1948), 57-58.

the comparison with the aeonic that nudges Psellus to recognise time as having determinations of being as well. By considering that man has his origin-*γέννησις* in the *ἄπειρον*, but begins his available being in the completeness of time-*καιρός*[67], Psellus introduces the dimension of time-*χρόνος* that is fundamental for humanity and its ways of knowing.

Every intellect (*νοῦς*) has everlasting (*αἰώνια*) essence, power and activity-*ἐνέργεια*, explains Psellus. The intellect understands (*νοεῖ*) everything at once and not the past as past and the future as future, but everything as present. It does not move, but recognises everything at once at as a whole. Because it is stationary, it is neither its essence nor its power and activity beneath the measure of time[68]. In the reflection on aeon and time (*περὶ αἰῶνος καὶ χρόνου*) Psellus remarks: The bodiless being has an everlasting essence and energy, like the intellect. Its essence is immovable and its energy is unchangeable. Heaven is everlasting according to its essence, but is subject (*κείμενος*) to its movement according to time. The bodies have both the essence and the energy in time, *ἔγχρονος*. This also concerns our body. The soul is everlasting in essence, but participates in time (*μετέχει*) in energy. It does not have all νοήματα in itself at the same time, but it goes (*μεταβαίνει*) from one thought to another[69]. Already earlier he has stated with emphasis that the essence of the soul is everlasting, but its energy is in accordance with time (*κατὰ χρόνον*) and with that of the time following (*τὰ τούτοις ἀκόλουθα*).[70] In the soul aeon and time are in mutual connection. But the aeon is the paradigm of time. It is supra-temporal and knows no change. In it dwell the identity, the good, the just and the similar grounds, which are immovable.[71]

While aeon and time are in a clear, though asymmetrical relationship, the divine eternity can not be compared to them. The difference is made by the answer of the question if and how the divine (*τὸ θεῖον*) is infinite (*ἄπειρον*). The whole being being (*πᾶν τὸ ὄντως ὄν*), the creation as a whole, is neither its quantity (*πλῆθος*) nor its size (*μέγεθος*) infinite, but only its power (*δύναμις*). But God is not a quantity, but the One par excellence (*κυρίως ἕν*). It has no size and it is bodiless. His activity

[67] Ibid., 20, Westerink, 26.
[68] Ibid., 23, Westerink, 27.
[69] Ibid., 107, Westerink, 59.
[70] Ibid., 52, Westerink, 38.
[71] Ibid., Appendix II, Westerink,102-104.

(*ἐνέργεια*) is not limited by any border, but all his energies and powers are infinite and non-exhaustive. He is still infinite according to his principle and his goal. He is not principled (*ἄναρχος*) and not limited (*ἀτελεύτητον*) and he is the universe of aeons (*ζύμπαν αἰώνιον*).[72] Got is eternal (*ἀΐδιος*), his state is the eternity (*ἀιδιότης*).[73]

Nevertheless, eternity is not totally separated from the aeon and time. A universal mediator of eternity in creation is nature. In a departure from the other Byzantine philosophers, Psellus differentiates between essence-*οὐσία* and nature-*φύσις*. While 'essence' characterises the being-constitution of the being, 'nature' means a special power-*δύναμις*. It is implanted by God himself in the bodies, that is, in the elements and that which is composed of them. It is an instrument of God (*ὄργανον τοῦ θεοῦ*). *Φύσις* is the dynamic principle of motion and standstill, as well as of existence, which pervades all created things and is to be seen on the part of man only through the vision of the *νοῦς*.[74] It is the constituting form through which the natural thing first gets its form and then actually becomes a *φυσικόν*.[75] Another mediating instance is just the structure of the noetic.

The first, supercosmic, non-participating and demiurgic νοῦς is '*πάντων ὑποστάτης*'. It lays the foundation of the specific and unchangeable, as well as of the changeable and the temporal in everything that exists. It creates 'everything at the same time in an instant (*ἐν μιᾷ ῥοπῇ σύμπαντα*).' The beings come forth according to their order and specifity: some by virtue of noetic property, some by virtue of mental mediation, some by virtue of physical motion.[76] No soul can directly participate in the first intellect, the supramundane one. However, the soul is able to participate in the inner-worldly intellect (*ἐγκόσμιος νοῦς*), which follows and participates in the first intellect.[77] Each intellect understands itself, or that which is above it, or that which is below or behind it (*τὸ μεθ' ἑαυτόν*). But it recognises that which is above it only in so far as it recognises itself.[78] The participating intellect (*ὁ μεθεκτός*

[72] Ibid., 16, Westerink, 24.
[73] Ibid., 15, Westerink, 24, 9.
[74] Ibid, 57, Westerink, 40.
[75] Linos Benakis, Ein unedierter Kommentar zur *Physik* des Aristoteles von Michael Psellos, in Linos Benakis, *Texts and Studies on Byzantine Philosophy* (Athens: Parousia, 2002), 364.
[76] De omnifaria doctrina, 24, Westerink, 27.
[77] Ibid., 21, Westerink, 26.
[78] Ibid., 22, Westerink, 26-27.

νοῦς), which is after the non-participating intellect, noetically possesses both the first intellect and the insight (*εἴδησις*) of all understanding. The non-participating intellect, however, grants to the *νόες* under it an appearance imprint (*ἔμφασις*) of its own existence. Based on this, according to the measure of their own nature, they recognise both the *intelligibilia* and the *sensibilia* according to their own causes.[79] All noetic species (*πάντα τὰ νοερὰ εἴδη*), that is, souls, intellects, angels, archangels, powers, and those similar to them, are both in each other, as well as existing in themselves. These asomatic noetic species, like the *θεωρήματα* in a soul, are united in each other, being no less separate and distinct.[80] Each intellect is filled with the divine *εἴδη*.[81] But the highest intellect wholly contains the high species. The lower intellects contain them only partially.[82]

The proceeding with the time on the part of Psellus proves two things. It is not problematic to see that he does not actually coin any innovative or different determinations of time, aeon and eternity.[83] Thus, at the same time, he demonstrates virtuosity largely not only in their determination and differentiation. Virtuosic is also his approach to bring to appearance the togetherness of the temporal, the aeonic and the eternal, the dynamic network woven by them and their asymmetrical, but nevertheless unified interaction.

5. System of interaction of the structures

As a first step, the firm coherence between time, place and comprehending thinking (understanding, *κατάληψις*) is to be noted here. In his groundbreaking consideration 'On the Place of God and on the fact that only the divine is indescribable (*ἀπερίγραπτον*)'[84], John of

[79] Ibid., 25, Westerink, 28.
[80] Ibid, 26, Westerink, 28.
[81] Like these of goodness, blessedness, justice, identity, likeness and those similar to them.
[82] Ibid., 27, Westerink, 28.
[83] This is confirmed by the other texts of Psellus published by Linos Benakis specifically dedicated to time and the eon (also dealing with the theme of eternity). There Psellus describes rigorously and exhaustively the characteristics of them already fixed before him, quoting most of all Gregory the Theologian, but also Plato, Aristotle, Plotinus (especially copiously), Porphyrius, Proclus, Simplicius, Basil the Great, Gregory of Nyssa. He adds no conceptual corrections to the known definitions – cf. Λίνος Μπενάκης, Χρόνος καὶ αἰών. Ἀντιπαράθεση ἑλληνικῆς καὶ χριστιανικῆς διδασκαλίας στὸ ἀνέκδοτο ἔργο τοῦ Μιχαὴλ Ψελλοῦ, in: Benakis, *Texts and Studies on Byzantine Philosophy*, 463-486.
[84] Johannes Damascenus, *Expositio accurata fidei orthodoxae*, I, 13, in: PG 94, 849B-860A.

Damascus points out that as 'subject to description (*περιγραπτόν*)' is to be determined that being which can be determined according to place or time, or as encompassed in comprehension. Indescribable is that which is not determinable in any of these ways.[85] Thus, the boundary between diastemic and non-diastemic is sharply drawn. In the following, the systematic connection of their structures is explained.

First, the difference and congruence between the various forms of the describable based on their local determinations are outlined. The bodily place (*τὸπος σωματικός*) is the limit of the surrounded (*πέρας τοῦ περιέχοντος*).[86] The bodies are each described according to their beginning and end, according to their physical location and as conceptually graspable.[87] Parallel with it exists the intellectual place (*νοητὸς τόπος*), in which is the noetic and bodiless nature. It has no figure (*σχῆμα*) and cannot be surrounded bodily.[88] About the angel it is said that it occupies place because it dwells intellectually and acts according to its nature. But the angel is also described according to time, because it has received beginning of its being, as well as, although intellectually, according to the place, as well as is graspable in the comprehension. It is circumscribed at its place of action.[89] The common connection and interpenetration of the somatic and noetic, which are determined spatially, temporally and conceptually at the simultaneously, are recognised as a common network by the specifics of their effect and interaction.

Only God is able to act simultaneously and everywhere.[90] The divine is indivisible, it is completely everywhere, in everything and above everything.[91] Because God is non-material and indescribable, He could not be bound in one place only. He is himself place, in that He fills everything, is exalted above everything and holds everything together. The Divine has ordained everything that does not depend on us in its proper and appropriate place and time. However, it is said that God is also in place: where his energy is manifested. He penetrates unmixed through everything and communicates his energy to everything – according to its nature and receptivity. Place of God, therefore, means

[85] Ibid., 853D.
[86] Ibid., 849C.
[87] Ibid., 853A.
[88] Ibid., 852A.
[89] Ibid., 853AB.
[90] Ibid., 853B.
[91] Ibid., 852C.

that which participates in a higher degree in his energy and grace. Everything is distant from God not by place but by nature.[92] That God, who is invisible by his nature, becomes visible through his energies, we recognise through the constitution of the world and its guidance.[93] God, whose energy composes, directs and permeates the world, is also actively located in this network. He participates in it. It is not a matter of a homogeneous presence: his energy does not reveal itself with the same intensity. It is there in consideration not only of the diversity of natures, but also of the unique power of comprehension of the individual hypostases.

The 'place' thus meant is not a point where nature is present, but a center of natural energy (*ἐνεργεῖ*) and a reference of its noetic apprehension. 'Place' is understood in terms of mental concentration of the activity of being (the energy, *ἐνέργεια*) that irreversibly engages existence. The temporality of the physical world is not static. The local and temporal extensions are given to each creature as determinants of their hypostatic existence. God enters into a relationship of being with the world: The divine energy permeates the created world. The place of God is the limit of his activity in the created world, his presence in the existence of creatures, which in a special kind dwells in the existence of those who willingly accept him. All places and times of the created things are localisations of the divine energy.[94]

The relational understanding of space and time in John of Damascus corresponds with the views of modern physics, in which space and time are considered as the result of the presence of matter and energy. John still insists in his relational concept that cosmic space receives its significance as a divine place. It is not measured as conventional distance between objects. The cosmos gives space to the mutual relationship between God and man without abolishing or annulling the distance separating the uncreated from the created nature. [95]

The relational network, which is unfolded by the being together of time, place and comprehension, has in no single point an abstract

[92] Ibid.,852AC.
[93] Ibid., 856A.
[94] Smilen Markov, *Die metaphysische Synthese des Johannes von Damaskus: Historische Zusammenhänge und Strukturtransformationen* (Leiden – Boston: Brill, 2015)127-129.
[95] Stoyan Tanev, 'The Concept of Energy in T. F. Torrance and in Orthodox Theology' in Participatio. *The Journal of the Thomas F. Torrance Theological Fellowship*, 4 (2013): 210.

character. It is permanently present, because it is the actual history of the cosmos and of mankind. One must notice that everything, including time, has its principle in the divine *λόγοι*/principles. The beginning point of the creature's movement does not belong to the trajectory of the movement itself. This beginning is the divine logos of the creature, which is not the creature itself.[96] They are *λόγοι* for everything: universal and specific. Not only for the essences, properties, etc., but also for the local situatedness, time, movement.[97] The logoi are pure dynamics carried by the causative divine energies and are in a permanent correspondence with the whole network of energies.

The logoi are eternally founded in God, but the things begin to exist according to the decision of the divine wisdom and will at a moment suitable to them (*ἐπιτὴδειος καιρός*).[98] By virtue of creation they receive their truly creaturely existence with its relative independence. Their development and decay are also connected with it. The beings with their essences, properties, relations etc. are created with the time. They exist thanks to the eternal logoi but also thanks to the energy of their own essence.[99] The single created being is completely included in the network which is constructed by the logoi, but as created from nothing it deviates in its existence more or less from its principles. Their existence is primarily connected with the movement in the time and with the history. The nature of everything created, i.e. of everything that is not God, exists in actuality only in history and becomes recognisable within historical existence.

God with his eternity is also not foreign to history, he is actually present in it. The interaction of eternity, aeon and time are evident and acting for the believer directly in the Eucharist. The liturgy is the *καιρὸς τοῦ ποιῆσαι τῷ Κυρίῳ* – the kairos of God's action. The divine eternity enters into the course of time and passes through it. The course of times is transformed by the divine eternity.[100] Its historical action is to be identified with the permanent activity of the logoi as well as with the physical presence of the divine Logos in the world. Just the physical

[96] Вадим Лурье, *История византийской философии – Формативный период*, Санкт Петербург: Axiōma, 2006, 372.

[97] Cf. Maximus Confessor, Epistulae, 12, in: PG 91, 485D; Ambigua ad Johannem, 7; 15; 17, in PG 91, 1217AB; 1228A-1229A; 1080A; 1245B.

[98] Ambigua ad Johannem, 7, in PG 91, 1081A.

[99] Ibid., PG 91, 1081AB.

[100] Цветковић, *Бог и време. Ученье о времену Светог Григорија Ниског* 155-156.

existence of Christ gathers the temporality of the world as the dynamic point of its ultimate state of being.[101]

The interconnection and interaction of time, eternity and aeon are fully present in the act of human divinisation (*θέωσις*) in the history of this world as conceived by the Eastern Christian tradition. The worthy, i.e. the saints, will be filled with the divine natural energy. They become all that God is, not however, according to their essence, but –through God's own existence working in them – according to their energy. They remain human beings by nature and their human natural energy works together with the divine one. In this synergy also the co-operation of time and eternity is realised, as it is modelled in Christ himself and in the Eucharist.[102] The existence of the saints and their experiential knowledge of the divine are to be defined as a 'borderline experience' of the world and its limit and to be interpreted as the point of contact with the divine par excellence.

Being at this boundary, however, is still not a presence in eternity itself, but rather a preparation for entering it. It could be said that it has an everlasting character. The standstill achieved in this state is similar to, but not identical with, the standstill in eternity. The relation with the divine at this limit is a relative compensation of the gap between God and man, which cannot be crossed in this world. The nature of man as well as of the whole creation will enter into a state of rest only after the end of the world.

The perfect deification of the worthy is attainable only at the goal, i.e. in the Kingdom of God, which is the space of standstill (*στάσις*). This standstill, in its turn, is not only stability, but also a 'movement' that transcends any movement. The standstill and the movement itself are overcome in God.[103] Therefore Maximus the Confessor speaks about a standstill in permanent movement and about an identical movement in standstill,[104] about a *δρόμος ἀεικίνητος*, about an eternally moving course.[105] This process is admittedly not realised in time – movement and time have no necessary connection. The movements of the deified

[101] Markov, *Die metaphysische Synthese des Johannes von Damaskus: Historische Zusammenhänge und Strukturtransformationen*, 129.

[102] Cf. Tanev, *Energy in Orthodox Theology & Physics. From Controversy to Encounter*, 141.

[103] H.U. v. Balthasar, *Kosmische Liturgie. Das Weltbild Maximus des Bekenners*, Einsiedeln ^{2}1961, 137.

[104] Quaestiones ad Thallasium, 65, in PG 90, 760A.

[105] Ibid., 17, in PG 90, 304CD.

in the kingdom of God, which are connected with the eternal life of God, are independent of time.[106] Man is deified infinitely, his deification knows no limit.[107]

6. Closing observations

In a brief concluding reflection, one should first confirm the conclusion that the central innovation of the Eastern Christian understanding of time, aeon, and eternity as divine processions is that they are not simply parallel and distinct, but genetically related.[108] Their connectedness does not cancel the difference between adiastemic and diastemic in the created cosmos. It is to be remembered in this context that one asserts both an extension of the whole cosmos and an innumerable set of concrete extensions which form the course of time. The aeon of the cosmos differs from the aeons of the noetic natures with their extensions and stands in a dynamic relationship to them. But it should not be forgotten that the beginning of time has an adiastemic character. The nature of the beginning-*ἀρχή* of time includes in itself significant properties of the aeonic and the eternal. Time, aeon and eternity form in this world a network in which they work and are together in a common dynamic. It is the network of the world history which will be removed only after the end of the world.

This network is not to be determined as substantial at all. It is not constituted by causal structure and corresponding processes. It is the network of existence. Abraham Joshua Heschel explains that the religious philosophy does not consider the proceedings in the world as causal structures, but as events.[109] One should think in the case of Byzantine understanding around event-*συμβάν* – coming together, convening, coinciding. In the terms of Heschel we may say that what happened in the system 'time-aeon-eternity' is not a causal effect and not a separated and rigid moment, but a dynamic extent – a happening.

[106] Ambigua ad Iohannem, 10, 31a, 9, in PG 94, 1164B.

[107] Quaestiones ad Thallasium, 22, in PG 90, 320D. Cf. J.-C. Larchet, *La divinisation de l'homme selon saint Maxime le Confesseur*, Paris 1996, 545-674.

[108] Bradshaw, Time and Eternity in the Greek Fathers, 360.

[109] Abraham Joshua Heschel, *God in Search of Man: A Philosophy of Judaism*, New York: The Noonday Press, ^{6}1994, 16-17.

Realism and Idealism: Converging Perspectives from Patristic Thinking and the Philosophy of Physics

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This paper explores the way in which two aspects of patristic thinking seem to have parallels with understandings to be found within the philosophy of science of the present time, especially as it has developed through reflection on the physicist's understanding of the world. The first of these aspects relates to the concept of *apophaticism*, which in recent decades has been made more prominent in theological discussion through the influence of Vladimir Lossky's focus on the 'mystical' nature of Orthodox theology. Here, insights into physics within the philosophy of science – exemplified by the work of Mary Hesse and Rom Harré – are presented as particularly relevant to exploring this concept. The second of these aspects of patristic thinking relates to the philosophical concept of *idealism*, often associated with the understanding of the eighteenth-century Anglican bishop, George Berkeley, but in fact to be found in a comparable form in the patristic era. The relevance of the ancient Greek philosophical concept of the *nous* - often used by patristic authors - is emphasized in relation to both topics.

Introduction

The Eastern Orthodox tradition is based on the consensus developed within the Christian community of the patristic period, but it is not something that can be adhered to simply through familiarity with the patristic writings and professing loyalty to their content. For one thing, the writings of the Fathers sometimes reflected the mistaken secular 'knowledge' of the period in which they lived,[1] which means that there

[1] Basil the Great, for example, illustrated a (legitimate) theological understanding through the mistaken science of his time, in which it was believed that not all animals are produced by

is sometimes a need for the process that Metropolitan Kallistos of Diokleia has called separating 'Patristic wheat … from Patristic chaff.'[2] For another, the concepts used in these writings may sometimes be understood in a way that mistakes the theological intention behind their use.[3] These factors underline the importance of Georges Florovsky's observation that to 'follow the Fathers does not mean simply to quote their sentences. It means to acquire their *mind*.'[4] This observation suggests, I have argued elsewhere, that there is a sense in which Anselm's concept of theology as 'faith seeking understanding' may, in the Orthodox context, profitably be explored in terms of the notion of 'Tradition seeking understanding.' [5] What is central to the Fathers' mind is not, in this perspective, their words as such, but what I have called their *spiritual instinct*: the noetic perception that constituted the foundation on which their verbal constructions were built.[6]

In this paper I shall explore the way in which two aspects of this patristic spiritual instinct seem to have parallels with understandings to be found within the philosophy of science of the present time, especially as it has developed through reflection on the physicist's understanding of the world. The first of these aspects relates to the concept of *apophaticism*, or negative theology, which in recent decades has been made more prominent in theological discussion through the influence of Vladimir Lossky's focus on the 'mystical' nature of Orthodox theology.[7] Here, I shall argue, insights into physics within the philosophy of science – exemplified by the work of Mary Hesse and Rom Harré – are particularly relevant to exploring this concept.

parents; he cites grasshoppers, small insects, mice, frogs and eels as creatures that come into existence spontaneously from the earth (Basil the Great, *Hexameron* IX.2).

[2] Timothy Ware [later Metropolitan Kallistos of Diokleia], *The Orthodox Church* (Harmondsworth: Penguin, 1957), 212.

[3] See Christopher C. Knight, *Science and the Christian Faith: A Guide for the Perplexed* (Yonkers: St. Vladimir's Seminary Press, 2020) 64-65, where the example is given of the way in which the term 'nature' has been understood in different ways by proponents and opponents of the Chalcedonian 'two natures' way of understanding Christ's humanity and divinity.

[4] Georges Florovsky, 'The Ethos of the Orthodox Church', *Ecumenical Review* 12 (1960):188.

[5] Christopher C. Knight, 'Tradition Seeking Understanding: Orthodoxy, Nature and Modern Science'; in Christopher C. Knight and Alexei V. Nesteruk, eds. *Eastern Orthodox Christianity and the Sciences: Theological, Philosophical and Scientific Aspects of The Dialogue* (Turnhout: Brepols, 2021) 19-32.

[6] For discussion of this concept of 'spiritual instinct' in relation to the patristic witness, see Knight, *Science and the Christian Faith*, 64-66.

[7] Vladimir Lossky, *The Mystical Theology of the Eastern Church* (Cambridge: James Clark, 1957).

The second of these aspects of the patristic spiritual instinct relates to the philosophical concept of *idealism*, often associated with the understanding of the eighteenth-century Anglican bishop, George Berkeley, but in fact to be found in a comparable form in the patristic era. Here, the comment of the astrophysicist, James Jeans – that in the context of modern physics the universe now 'looks more and more like a great thought rather than a great machine'[8] – provides the starting point for the scientific component of the exploration that I shall present.

Apophaticism and the nous

I shall begin, then, with an exploration of apophaticism, but not – at least initially – in terms of the usual distinction that is made between *apophatic* theology, which proceeds by negations, and *cataphatic* theology, which proceeds by affirmations. Instead, I shall begin with a concept that has been important for the science-theology dialogue ever since Ian Barbour's pioneering work in the second half of the twentieth century: that of *critical realism*. Barbour saw this concept as relevant to the interpretation of the languages of both science and theology, arguing that the role of models and analogies in both languages[9] points towards the way in which both can be seen as making 'tentative ontological claims that there are entities in the world something like those postulated.'[10]

The scientific realism behind this understanding is 'critical' in the sense that it recognises that, in the history of physics, changes in the supposed ontology of the world have sometimes occurred, so that we must reject the naïve realism often held in the nineteenth century, which assumed an exact correspondence between the entities postulated by scientific theory and the entities actually existing in the world. While this observation is clearly valid, however, we should arguably be wary of the way in which these historical developments have often been interpreted by participants in the science-theology dialogue in terms of what may be a simplistic interpretation of Karl Popper's sense of

[8] James Jeans, *The Mysterious Universe* (Cambridge: Cambridge University Press, 1930),137.
[9] Ian G. Barbour, *Issues in Science and Religion* (London: SCM, 1966)156-174; 216-218.
[10] Ian G. Barbour, Religion in an Age of Science: The Gifford Lectures 1989-1991, Volume 1 (London: SCM, 1990), 43.

'increasing verisimilitude' in the development of scientific theory. In a way that arguably oversimplifies what Popper himself claimed, many of these participants have presumed that scientific theory truly points to what the world consists of – to its ontology – and that successive theories do so ever more accurately. There are, however, a number of problems associated with this understanding, which have been debated by philosophers but largely ignored by the dialogue's participants.[11]

One of these problems is that scientific theory changes sometimes involve major changes in ontological description, which are hard to see as consonant with the notion of increasing ontological verisimilitude. Moreover, as Thomas Kuhn has noted, in two successive changes there may not even be a continuous direction of change. Kuhn, on the basis of this and other considerations, took up a sceptical stance in relation to scientific realism, especially in its ontologically-focused form, declaring that 'the notion of a match between the ontology of a theory and its 'real' counterpart in nature now seems to me illusive in principle.'[12] However, while Kuhn's stance has sometimes been interpreted as 'anti-realist,' this may be a simplistic interpretation of his views,[13] and certainly the majority of philosophers of science have not taken an anti-realist stance. Working scientists usually feel quasi-instinctively that their theories genuinely point to the way the world really is, and the majority of philosophers would agree that, unless this were the case, the extraordinary success of the sciences – practical as well as theoretical – would be inexplicable.[14]

Some of these philosophers have, nevertheless, suggested that a coherent scientific realism must not only be a 'critical' realism that takes account of changes in scientific understanding, but should also cease focusing on the ontology of entities. Mary Hesse, for example, in her understanding of physics, has argued for what she calls *structural realism*. It is, she says, 'undeniable that mathematical structures become

[11] For a recent examination of philosophers' discussions of this topic, see Graham Oddie, 'Truthlikeness', *The Stanford Encyclopedia of Philosophy* (Winter 2016 Edition), ed. Edward N. Zalta, URL = <https://plato.stanford.edu/archives/win2016/entries/truthlikeness/>.

[12] Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: Chicago University Press, 1962), 206-207.

[13] See section 7 ('Historical Challenges to Scientific Realism') in Michael Liston, 'Scientific Realism and Antirealism', *Internet Encyclopedia of Philosophy* – https://iep.utm.edu/sci-real/ .

[14] For an account of recent philosophical debate on this issue, see Liston 'Scientific Realism and Antirealism'.

ever more unified and universal with every advance in theory; the structural realm of physics is truly progressive.' However, she observes, 'the substantial description of what the structures relate changes radically from theory to theory.'[15] We should, she suggests, be realists about the structures that science claims to reveal but not about the ontology that is assumed in the description and investigation of these structures.

A comparable understanding arises from the work of Rom Harré on what he calls *referential realism*, in which two modes of scientific reference are distinguished. The first – as in the statement 'this grey powder is a sample of gallium' – requires, as he puts it, simply the ability to 'pick out a figure from a ground.' The second – as in the statement 'whatever is the cause of these bubbles is a neutrino' – involves the cognitive act of conceiving and accepting a theoretical account of the possible causes of an observed phenomenon.[16] The importance of this distinction, he suggests, is that the latter mode of reference – which he regards as being as legitimate as the first – is in practice often uncritically translated by physicists into the first kind of referential statement through an essentially arbitrary ontological assumption. He gives the example of the neutrino and the cloud chamber bubbles that first revealed its existence. There is, he argues, nothing in the formal referential statement – 'whatever is the cause of these bubbles is a neutrino' – that makes it necessary to conceive the neutrino as it is usually conceived: as a particle. (Indeed, he notes, there exists an alternative metaphysics in the understanding advocated by the quantum physicist, David Bohm.)[17] 'The logical grammar of the … referential format' Harré argues, 'is neutral. It is the conservative metaphysical predilections of physicists that push the ontology that way.'[18]

Arguments of this kind – for some reinforced by the notion of 'ontological relativity' developed by W. V. Quine[19] – suggest that we

[15] M. B. Hesse, 'Physics, Philosophy and Myth', Physics, *Philosophy and Theology: A Common Quest for Understanding*, eds. R. J. Russell, W. R. Stoeger and G. V. Coyne (Vatican City State: Vatican Observatory, 1988), 188.

[16] Rom Harré, *Varieties of Realism: A Rationale for the Natural Sciences* (Oxford: Basil Blackwell, 1986), 101ff.

[17] David Bohm, *Wholeness and the Implicate Order* (London: Routledge & Kegan Paul, 1980).

[18] Harré, *Varieties of Realism*, 316.

[19] W. V. Quine, 'Ontological Relativity', in *Ontological Relativity and Other Essays* (New York: Columbia University Press, 1969), 26-68.

should be wary of accepting the ontologically-focused kind of critical realism that many participants in the science-theology dialogue speak of as a proper interpretation of the status of scientific theory. However, this justifiable wariness should not be taken to imply that it is not possible to defend the referential success of scientific theory. Rather, it suggests that a kind of radically modified critical realism – abandoning even 'tentative' claims about ontology and in their place positing valid *reference* – might be the best way forward in the debate about the nature of scientific understanding. According to this modified understanding of scientific critical realism, we can legitimately explore the structure of the world and validly *refer* to aspects that world, but at the same time must be extremely wary of thinking that we have a grasp of the world's ontology.

Many participants in the science-theology dialogue – following Barbour's notion of the parallels between theological and scientific rationality – have seen scientific critical realism as having implications for how we should understand the realism of theological language. However, they rarely acknowledge the kind of modification to scientific critical realism that the work of philosophers such as Hesse and Harré suggests is necessary, and therefore fail to see how this modification, if applied to theological as well as to scientific language, may be important in reinforcing a view of theological language that is characteristic of Eastern Orthodox understanding.

Particularly in the form of it expounded by Valdimir Lossky, this Orthodox view of theological language manifests a different understanding to any to be found in most Western theological traditions. This view is rooted in a number of patristic writings, especially those of the Cappadocian Fathers and those now usually called pseudo-Dionysian (since the ancient attribution of them to Dionysius the Areopagite, mentioned in the Acts of the Apostles (17:34), is no longer taken seriously.) This view makes a distinction between two theological paths: that of *cataphatic* or positive theology, which proceeds by affirmations, and that of *apophatic* or negative theology, which proceeds by negations. Lossky notes that in Western theology these two ways – even when acknowledged[20] – tend in practice to be reduced

[20] This Western acknowledgment is clear, for example, in those strands of the mediaeval Western thinking that were influenced by the writings attributed to Dionysius the Areopagite,

to one, simply making negative theology a corrective to affirmative theology. The Orthodox understanding, Lossky suggests, tends to have a different and more radical understanding of the importance of apophaticism, so that cataphatic affirmations are seen primarily as providing a kind of ladder towards an increasingly contemplative and non-conceptual knowledge of God.[21] What this kind of understanding leads to is recognition that the concepts we form 'in accordance with the understanding and the judgement which are natural to us, basing ourselves on an intelligible representation, create idols of God instead of revealing to us God Himself.'[22] The terms that we apply to God in cataphatic theology are not, says Lossky, 'rational notions which we formulate, the concepts with which our intellect constructs a positive science of the divine nature'. Rather, they are 'images or ideas intended to guide us and fit our faculties for the contemplation of that which passes all understanding'.[23]

Behind this Christian apophaticism – parallels to which may be found in strands of the Islamic tradition[24] – lies the way in which, in the Greek patristic understanding (and especially in its later use within the Byzantine hesychast tradition) knowledge of God is far more than an understanding based on the discursive reasoning faculty. This knowledge must be based first and foremost on contemplation (*theōria* in Greek,) which is seen as the perception or vision of the highest human

particularly after a translation of those writings into Latin (produced by John Scotus Eriugena in 862) became influential in the twelfth century. However, in later thinking there was a tendency to treat 'mystical theology' as a specialised 'branch' of theology rather than as what Lossky urges: the overarching context for all theology.

[21] Lossky, *The Mystical Theology of the Eastern Church*, 40.

[22] Ibid, 33.

[23] Ibid, 40.

[24] The Arabic term for 'negative theology' is *lahoot salbi*, and its practice involves the use of *ta'til*, which means 'negation'. It is particularly characteristic of Shi'ite Islam. God is seen in this tradition of thinking in terms of 'two ontological levels', the first of which is that of the Essence (*ḏāt*). This essence – in much the same way as in the Orthodox Christian understanding of the divine essence (*ousia*) – is said to be 'forever inconceivable, unimaginable, above all thought, beyond all knowledge. It can only be described by God through revelations and can only be apprehended by a negative apophatic theology.' However, if things were to remain so, no relation would be possible between the Creator and His creatures according to this Islamic understanding. Thus, in that understanding, 'God, in his infinite grace, lets blossom in his own being another level: of Names and Attributes (*asmā' wa ṣefāt*) by which He reveals himself and makes himself known. This revealed level, recalling the *Deus revelatus* of Christian theology, is no longer God the Unknowable, but God the Unknown who aspires to be known. It is the exoteric, manifest, revealed level of God that can be known in Him.' ('Shi'ite Doctrine' article in the online Encyclopaedia Iranica http://www.iranicaonline.org/articles/shiite-doctrine retrieved 15th April 2020).

faculty, the 'intellect' (*nous*).[25] This faculty – spoken of in strands of Islamic as well as of Christian writing[26] – is essentially intuitive in its operation, so that it is not the same as the discursive reasoning faculty (*dianoia*), the latter understood as functioning properly in theological analysis only if rooted in the spiritual knowledge (gnōsis) obtainable through the intellect.[27] (As I have argued elsewhere, this implies that the use of philosophy in the theological task must be understood by Orthodox Christians in a different way to that which is common within many Western Christian traditions, and this applies particularly to the concept of 'natural theology.') [28]

Sometimes, the radical apophaticism of Orthodox theological writers is expressed by them only in terms of the recognition that we cannot straightforwardly apply to God categories comprehended in relation to created things. However, in the patristic period apophaticism was sometimes understood more broadly. For Basil the Great, in particular, it was (as Lossky notes) 'not the divine essence alone but also created essences that could not be expressed in concepts. In contemplating any object we analyse its properties; it is this which enables us to form concepts. But this analysis can in no case exhaust the content of the object of perception.' There will always remain a kind of 'residue, which escapes analysis and which cannot be expressed in concepts, it is the unknowable depth of things, that which constitutes their true, indefinable essence.'[29] Over and above the modern philosophical arguments about the ontology of created things that I have outlined, this Basilian view challenges the simplistic critical realism that is characteristic of the science-theology dialogue by pointing towards

[25] For an analysis of this concept in terms of modern scientific understandings, see Christopher C. Knight, 'The Human Mind in This World and the Next: Scientific and Early Theological Perspectives', *Theology and Science* 16 (2018): 151-165.

[26] This is especially the case in those strands of Islamic thinking that are attentive to the usage of early Islamic philosophers such as Al Farabi, Avicenna and Ibn Rushd.

[27] See e.g., the brief discussion of all these terms given in the "glossary" section of *The Philokalia, Vol. 1*, eds. G. E. H. Palmer, Philip Sherrard and Kallistos Ware (London and Boston: Faber and Faber, 1979), 357-367. There may, however, be a tendency in this glossary to suggest a uniformity of usage that is in fact not to be found in the texts of the Philokalia.

[28] Christopher C. Knight, *Eastern Orthodoxy and the Science-Theology Dialogue* (Cambridge: Cambridge University Press, 2022) 5-16; c.f. Christopher C. Knight, '"Analytic" Natural Theology: Orthodox or Otherwise?', *St. Vladimir's Theological Quarterly* 65 (2021): 57-85; Christopher C. Knight, 'Natural Theology: Complementary Perspectives from the Science-Theology Dialogue and the Eastern Orthodox Tradition', *Philosophy, Theology and the Sciences* 8 (2021): 259-284;

[29] Lossky, *The Mystical Theology of the Eastern Church*, 33.

what we might call *apophatic critical realism*, which acknowledges that while we can validly *refer* to both God and created things, there are aspects of both that are unknowable by us in conceptual terms, so that we must be extremely wary of thinking that our words can ever circumscribe their reality.

In the Western science-theology dialogue, it has perhaps been Arthur Peacocke who has, at least in an embryonic way, been most aware of this kind of perspective, since he has recognised that models in both science and theology 'are concerned less with picturing objects than with depicting processes, relations and structures (i.e. patterns of relationship.) What matter is 'in itself' and what God is 'in himself' are left as unknown and unknowable.'[30] Here, his attitude has been influenced by Janet Martin Soskice's way of understanding religious language in terms of the way in which its metaphorical nature provides genuine *reference*. What Soskice perceptively analyses[31] is the way in which religious language usage may be clarified in terms of the theory of reference developed (in a non-theological context) by philosophers such as Hilary Putnam and Saul Kripke.[32] Nevertheless, as I have discussed elsewhere,[33] while Soskice makes some important observations about the concepts of 'real essences' and 'natural kinds' used within the philosophical theory of reference that she adopts, both she and Peacocke fail to develop their embryonic insights into the kind of *apophatic critical realism* in which there is as – for Basil the Great – something about both God and created things that escapes analysis and cannot be expressed in concepts.

The 'Mind of God'

In relation to created things, one aspect of this 'escape' is the avoidance, in an important strand of patristic thinking, of the kind of materialism

[30] ArthurPeacocke, *Intimations of Reality: Critical Realism in Science and Theology* (Notre Dame, IN, University of Notre Dame Pess, 1984) 42.

[31] Janet Martin Soskice, *Metaphor and Religious Language* (Oxford: Clarendon, 1985). Peacocke's reference was, however, to her doctoral thesis since this book – based on that thesis – had not yet been published at the time of his own *Intimations of Reality*.

[32] For an introduction to this approach, see Stephen P. Schwartz, *Naming, Necessity, and Natural Kinds* (Ithaca, NY: Cornell University Press, 1973).

[33] Christopher C, Knight, *Wrestling With the Divine: Religion Science, and Revelation* (Minneapolis, Fortress, 2001) 97-105.

that views the real essence of a physical substance in terms of some aspect of the created world. (For Kripke, for example, this essence is to be understood in terms of its chemical composition.) For an important component of Orthodox understanding, however, any such aspect of the created world is no more than an 'outward' aspect of what that substance is in the 'mind of God.' A patristic figure who is particularly relevant here is one who has clearly influenced Lossky's apophaticism. This is Gregory of Nyssa, whose thinking - as Joshua Schooping has shown – exhibits interesting parallels, not only with Berkeleyan idealism but also with the thinking of the physicist, David Bohm, about questions arising from quantum mechanics.

Gregory was not, of course, attempting to answer the questions addressed by Bohm, but to answer a question much asked in his own time: that of how an immaterial principle, God, could create the material universe. As George Karamanolis puts it, Gregory's answer to this question was 'that the question itself is misguided, because the world is not material at all.' Rather, for Gregory, the world 'is constituted of reasons or qualities … which are generated in the divine mind and are recognised in the human mind. This does not mean that Gregory denies the existence of material entities. All he denies is the independent existence to matter.'[34]

Gregory's understanding, Karamanolis explains, is based on the notion that what ultimately exists is a set of mental realities that relate to the qualities we perceive in created things. For Gregory these exist – and always have existed – in God's mind. God, he says, 'established for the creation of beings all things through which matter is constituted: light, heavy, dense, rare, soft, resistant, humid, dry, cold, hot, colour, shape, outline, extension. All these are in themselves concepts [*ennioai*] and bare thoughts [*psila noemata*]. None of them is matter on its own, but they become matter when they combine with each other.'[35]

As Karamonolis notes, this focus on qualities is 'not an ad hoc answer to the question of the nature of matter but rather part of a fairly sophisticated theory that permeates Gregory's entire work.'[36] In some of his works, Gregory calls these qualities *logoi* – 'words' or logical

[34] George Karamanolis, *The Philosophy of Early Christianity* (Durham: Acumen, 2013),106.
[35] Quoted by Karamanolis, ibid., 102.
[36] Karamanolis, ibid., 102.

principles. For Gregory, 'none of the things that pertains to the body on its own [is] a body, not shape, not colour, not weight, not extension, not size, nor any of the other things regarded as qualities, but each of them is a logos and their combination and unity with each other makes a body […] these qualities which complement the body are grasped by the intellect and not by sense perception'.[37] In this passage, Karamanolis observes, 'Gregory makes clear that bodies are intelligible to the extent that they are made up of intelligible entities, the qualities or *logoi*, which are hosted by the divine intellect but also by the human intellect. While creation of sensible, corporeal entities amounts to the combination of the logoi of God, we, humans, in turn get to know these entities by combining the logoi that make them up.'[38]

This ancient philosophical framework does not, of course, have much appeal for many present-day Christians, and it may well be that its idealistic aspect now needs to be expressed in different terms. However, we need to recognise that the theological thinking of Gregory – like that of all creative theologians in all periods – was inevitably expressed in terms of the philosophy of the writer's own time. (As A. N. Whitehead once put it, there exist 'fundamental assumptions' in any epoch and culture, which 'adherents of all the various systems within the epoch unconsciously presuppose … [since] no other way of putting things has ever occurred to them.')[39] It is often only from the perspective of a later period that we can begin to make a distinction between what is central to what is being expressed – the 'spiritual instinct' of which I have already spoken – and the philosophical framework and (sometimes flawed) reasoning through which that instinct has been expressed. The philosophical framework that Gregory adopted and adapted may for many have little appeal now, but the quasi-idealist spiritual instinct that he seems to want to express arguably remains an interesting one, not least – as we have already noted – because of the idealist strand of thinking among early twentieth century physisicists, summed up in James Jeans's comment that the universe now 'looks more and more like a great thought rather than a great machine'.[40]

[37] Quoted by Karalanolis, ibid.,104.
[38] Ibid.
[39] A. N. Whitehead, *Science and the Modern World* (New York: Mentor Books, 1948) 49-50.
[40] James Jeans, *The Mysterious Universe* (Cambridge: Cambridge University Press, 1930), 137.

Admittedly neither Jeans nor Arthur Eddington – a fellow astrophysicist with similar idealist leanings – had any formal philosophical training, and this made it relatively easy for Susan Stebbing, who did have such a training, to demonstrate the philosophical shortcomings of their writings on this topic.[41] This kind of criticism was, indeed, such that later scientists – even if their instincts were of an idealist kind – became wary of trespassing on philosophical territory. That theological scholars should have followed scientists in this wariness is, however, less easily understandable, except perhaps in terms of the common misunderstanding of the views of the most famous idealist of the modern era, the eighteenth century Anglican bishop, George Berkeley. This misunderstanding has been pointed out by Keith Ward, who has analysed the way in which people like John Polkinghorne, in their judgment that we need to avoid 'retreating into Bishop Berkeley's idealist castle',[42] in fact take up a stance that does not sit easily with classical Christian theism.

Ward explains that Berkeley did not claim – as many think he did – that 'physical objects do not exist, and that everything is in human minds, so that the world disappears when humans are not looking at it.' This view may constitute one form of idealism but, as Ward comments, to assume that Berkeley thought in this way is 'a complete misunderstanding'. Berkeley, in assuming that physical objects cannot exist without some perceiving mind, was, says Ward, essentially saying that 'if there is a physical world independent of humans, it must exist in the mind of God … though not exactly as it is perceived by humans.' This position is, he observes, certainly idealist in the sense that matter 'exists as the content of mental acts, and could not exist on its own.' Nevertheless, he goes on, this position 'is not very far, if it is any distance at all, from classical Christian theism', since the Christian believes that 'God who is not material, can exist without a material universe, but matter cannot exist without God. If God is anything like a mind – and God is said to know, to act, to have purposes and to be wise – then Christians must believe that mind can exist without matter.' [43]

[41] L. Susan Stebbing, *God and the Physicists* (Harmondsworth: Penguin, 1937).

[42] John Polkinghorne, *One World: The Interaction of Science and Theology* (London: SPCK, 1986), 109.

[43] Keith Ward, 'Bishop Berkeley's Castle: John Polkinghorne on the Soul', in *God and the Scientist: Exploring the Work of John Polkinghorne*, eds Fraser Watts and Christopher C. Knight

There are, it must be said, theological aspects of Ward's arguments in favour of idealism at which Orthodox Christians might look askance, and I have discussed these elsewhere.[44] Nevertheless, the very fact that his view exhibits real parallels with Gregory of Nyssa's understanding indicates that Gregory's views are still worthy of interest in modern philosophical terms, even if we also need to recognise that we must address the way in which they will inevitably seem problematical for the scientifically-literate scholar of the present day.

Can a version of Gregory of Nyssa's view be held today?

One of the problems that presents itself in this respect is Gregory's stress on 'qualities' of a kind that we now think of as the outcome of factors explicable by 'laws of nature' rather than as things in themselves or mental ideas. (Colours, for example, we see in terms of particular distributions of intensity of electromagnetic radiation at various wavelengths.) However, this problem is not entirely destructive of Gregory's picture since, if we put aside (as we must) his *specific* examples of what he calls qualities or *logoi*, it is still possible to interpret these *logoi* as incorporating what we now call the laws of nature and the inner essences of created things. This will especially be the case if we take into account the later expansion of the notion of *logoi* to be found in the work of Maximos the Confessor,[45] for whom the *logos* of each created thing is seen as being, in some sense, a manifestation of the divine *Logos* [Word] through which, in the beginning, 'all things came into being' (John 1:3). This understanding of the *logoi* of created things is clearly related to our current understanding of inner essences and the laws of nature since for Maximus – as one recent commentator has put it – 'Christ the creator Logos has implanted in every thing a characteristic

(Farham: Ashgate, 2012) 127.

[44] See Knight, *Science and the Christian Faith*, 109-111.

[45] Maximus has evoked a great deal of interest in recent decades in both Orthodox and Western Christian communities, with significant studies including: Paul Blowers, *Maximus the Confessor: Jesus Christ and the Transfiguration of the World* (Oxford: Oxford University Press, 2016); Nikolaos Loudovikos, *A Eucharistic Ontology: Maximus the Confessor's Eschatological Ontology* (Brookline: Holy Cross, 2010); Andrew Louth, *Maximus the Confessor* (London and New York: Routledge, 1996); Lars Thunberg, *Microcosm and Mediator: The Theological Anthropology of Maximus the Confessor* (Chicago and La Salle: Open Court, 1995); Hans Urs Von Balthasar, *Cosmic Liturgy: The Universe according to Maximus the Confessor*, 3rd ed. (San Francisco: Ignatius Press, 1993).

logos, a 'thought' or 'word' which is God's intention for that thing, its inner essence which makes it distinctively itself'.[46]

A second aspect of Gregory's understanding that may seem problematical to us is his focus on the human mind as what makes perception possible. At first sight, this focus seems to ignore the sense perception that is so important to the usual understanding of scientific objectivity. However, we need to recognise that Gregory's anthropology is one in which the what he calls the soul proper (*kyrios psyche*) or true soul (*alethes psyche*), while intellectual in nature, mixes with our material nature *through* the senses. For Gregory, it is not the senses that perceive, but rather the *nous* that perceives through the senses. Even from a purely scientific perspective, we should not dismiss this notion, since we can see clear reflections of it in the modern psychology of perception, which stresses the way in which our perceptions rely not just on our sensory capacities but also on the mind's way of interpreting the data that comes through those capacities. In Gregory's understanding, however, we find something more distinctly philosophical and theological than this. He believes, as Karamanolis puts it, that 'the intellect, nous, pervades all sense organs and permeates the entire body and renders the entire human nature rational, and in this sense, similar to God.'[47] This understanding is, as Karamanolis notes, rooted in the secular philosophy of Gregory's time, displaying 'striking affinities with the views of Plotinus and Porphyry'. [48]

This ancient philosophical framework does not, of course, have much appeal to many present day Christians. However, we need to recognise that the theological thinking of Gregory – like that of all creative theologians in all periods – is inevitably expressed in terms of the philosophy of the writer's own time.[49] It is often – as we have already noted in the context of Whitehead's comments – only from the perspective of a later period that we can begin to make a distinction

[46] Kallistos Ware, Bishop of Diokleia, 'God Immanent yet Transcendent: The Divine Energies according to Saint Gregory Palamas', in Philip Clayton and Arthur Peacocke, eds., *In Whom We Live and Move and Have our Being: Panentheistic Reflections on God's Presence in a Scientific World* (Grand Rapids: Eerdmans, 2002), 160.

[47] Karamanolis op.cit. 212 referring to Gregory of Nyssa, *De hom.opif.* 140A.

[48] Karamanolis op.cit., 105.

[49] In the context of science, A. N. Whitehead, in his *Science and the Modern World* (New York: Mentor Books, 1948) has put it this way: that there exist 'fundamental assumptions' in any epoch and culture, which 'adherents of all the various systems within the epoch unconsciously presuppose … [since] no other way of putting things has ever occurred to them' (49f).

between what is central to what is being expressed – the theological 'instinct' of which I have spoken – and the philosophical framework and (sometimes flawed) reasoning through which that instinct has been expressed. The philosophical framework that Gregory adopted and adapted may for many have little appeal now, but the idealist spiritual instinct that he seems to want to express arguably remains an interesting one for three reasons, quite apart from the fact that (for those who use the concept of *nous*) any 'spiritual instinct' will be valid when its origins lie in the perception of the enlightened *nous*.[50]

One of these reasons is that – as we have noted in the context of Karamanolis's and Schooping's observations – there are clear resemblances between Gregory's understanding of reality and the much later understanding of George Berkeley, [51] which has been defended by Keith Ward and others as consonant with modern scientific perspectives. The second is that even if the human mind should, at one level, be seen as an emergent property of matter, it has characteristics that do not straightforwardly fit into the usual emergentist and evolutionary frameworks. Our abstract mathematical ability, for example, has often been seen as something that is difficult to fit into the framework provided by evolutionary psychology in its usual 'blind watchmaker' form, since that ability seems to go far beyond what was appropriate for the survival of our ancestors,[52] and may be seen as indicating an affinity between the human mind and the mind of God.[53] The third

[50] This notion of how true theology has its origin in the enlightened nous is central to the current Eastern Orthodox understanding of natural theology. See Christopher C. Knight, 'Natural Theology and the Eastern Orthodox Tradition', in Russell Re Manning, ed. *The Oxford Handbook of Natural Theology* (Oxford: Oxford University Press, 2013), 213-226.

[51] Karamanolis himself actually sees more resemblances in certain respects to the perspectives of John Locke. However, other historians of philosophy have seen Gregory much more in terms of his anticipation of the Berkeleyan understanding. See e,g, the different views expressed in: Darren Hibbs, 'Was Gregory of Nyssa a Berkeleyan Idealist?', *British Journal of Philosophy* 13 (2005) 425-35; Jonathan Hill, 'Gregory of Nyssa, Material Substance and Berkeleyan Idealism', *British Journal of Philosophy* 17 (2009): 653-83.

[52] This observation does not imply that an evolutionary framework must be abandoned, but it does suggest either some kind of 'guiding' of the evolutionary process or else some kind of framework in which the predictability of that framework is seen as part of God's initial design of the whole cosmos. The latter view is advocated in terms of evolutionary convergence in Knight, *Science and the Christian Faith*.

[53] The sociologist Peter Berger, in his *A Rumour of Angels: Modern Society and the Rediscovery of the Supernatural* (Harmondsworth: Penguin, 1969) famously used mathematics as one of the 'signals of transcendence' that led him to take theological thinking seriously. In a comparable way, the mathematician, Roger Penrose, while avoiding any specific theological speculation, has seen mathematics as pointing to some kind of Platonic realm of reality.

reason for examining the human mind more closely in relation to questions about idealism is, however, possibly the most important, at least in the context of the science-theology dialogue. It is that scientific perspectives suggest that, even if no acceptable form of idealism has yet been developed, something akin to Ward's understanding may still be required.

The point here is that the role of the observer in 'creating' physical reality is a major issue in the interpretation of quantum mechanics. While astonishingly fruitful in making predictions at the sub-atomic level, this branch of physics has proved extremely difficult to interpret philosophically. It seems to suggest that the world, until observed, consists not of matter in a particular physical state but rather of multiple potentialities described by a wave function. Only one of these potentialities is actuated through the action of an observer, who is said (in the dominant 'Copenhagen interpretation') to 'collapse the wave function.'[54] This understanding leads, however, to counter-intuitive situations, of the kind indicated in the famous paradox of Schrödinger's cat, which arises from thinking about the situation of a cat, which has been put into a box that has been set up in such a way that there is a fifty per cent probability that the cat will die before the box is opened and the situation observed. Quantum mechanics suggests, counter-intuitively, that the cat is in fact in two states just before the box's opening: one in which it is dead and one in which it is alive. Only when the observation is made is one of these two potentialities brought into being.[55]

In the judgment of some, this philosophical problem of the role of the observer in quantum mechanics has only been dealt with in a coherent way through the notion of 'the implicate order' that David Bohm has offered, [56] which – like the related Jung-Pauli principle, which combines insights from both C. G. Jung's psychology and Wolfgang Pauli's understanding of quantum physics[57] – may in certain respects may be

[54] This phrase is associated with the dominant 'Copenhagen interpretation' of quantum mechanics, though as we shall note this is not the only interpretation available.

[55] For an accessible description of this paradox and a more general introduction to quantum mechanics, see John C. Polkinghorne, *The Quantum World* (Princeton, Princeton University Press, 1985).

[56] David Bohm, *Wholeness and the Implicate Order* (London, Routledge & Kegan Paul, 1980).

[57] See Harald Atmanspacher, 'The Pauli-Jung Conjecture and its Relatives: A Formally Augmented Outline', *Open Philosophy*, https://www.degruyter.com/document/doi/10.1515/op-phil-2020-0138/html .

seen as a manifestation of the 'dual aspect idealism'[58] for which Ward pleads. The widespread rejection of such understandings by physicists is not due to their being incompatible with quantum mechanics, on which Bohm and Pauli were acknowledged experts. They have been rejected largely, it would seem, because of their metaphysical overtones. Paradox (or an unfalsifiable 'many worlds' interpretation) is generally preferred to the notion that mind and matter should be reinterpreted in a way that is not essentially materialist.

The role of the nous.

It is significant, in my judgment, that in relation to this theological analysis of the way in which aspects of modern physics affect reflection on both apophaticism and idealism, the role of the *nous* – as understood in the philosophy of the ancient world – may be of considerable importance. It not only reinforces perspectives that arise from modern physics, in the way that I have outlined, but it also provides an important perspective that moves us towards the kind of theological anthropology that is to be found in both biblical and classical Christian literature, in which body and mind are seen as components of a unified being, and away from the tendency within Christian thinking that has its roots in either an ancient Greek or modern Cartesian kind of dualism, in which body and mind are seen as distinct entities in some kind of loose association.

There has, admittedly, been a revival of the more traditional Christian understanding in recent years, which has come about not only because theologians have reacted against the dualism common in certain periods in the past, but also – and perhaps primarily, especially within the science-theology dialogue – because analyses of brain damage and of brain scanning data have led cognitive scientists more and more to emphasise and elucidate the physical basis of human mental functioning.[59] However, this emphasis has led to a situation in

[58] Ward prefers this term to that advocated by philosophers like John Searle – 'dual aspect monism' – for reasons discussed in Knight, *Science and the Christian Faith*, 109.

[59] See e.g. Warren S. Brown, Nancey Murphy and H. Newton Malony, *Whatever happened to the Soul?: Scientific and Theological Portraits of Human Nature*, (Minneapolis, Fortress Press, 1998); c.f. Nancey Murphy, *Bodies and Souls or Spirited Bodies?* (Cambridge: Cambridge University Press, 2006).

which the notion of mental functioning typically used by participants in the science-theology dialogue is one that focuses on the processes seen in modern scientific discussion as constitutive of that functioning, i.e. those associated with sense perception, memory, reasoning, and emotion. While there has in recent decades also been recognition by scientists of unconscious processes, it is only the reality of what is called the 'cognitive unconscious'[60] that is usually recognised, so that there has been little or no consideration of other unconscious processes, whether of the kind hypothesised in therapeutic practice of the Freudian or Jungian kind,[61] or of the kind which, in early Christian theology, was often expressed in terms of the intuitive functioning of the faculty labelled in ancient Greek philosophy as the *nous*.

I have argued elsewhere[62] that acceptance of the reality of this faculty will, in two related ways, significantly affect the way in which the notion of *mind* is used within the dialogue. The first of these relates to the issue of emergence of the mental from the physical; the second relates to our understanding of the human condition in the 'world to come'. There is no room here, however, to repeat these arguments. Rather, I should like to draw my thoughts to a conclusion by noting an aspect of the way in which, if we follow the patristic understanding, and especially its articulation by Gregory of Nyssa, the whole of the spiritual life may be seen in terms of a journey towards the full functioning of the *nous*.

At one level, Gregory's framework manifests very clear parallels with that to be found in the neo-Platonic thinking of Plotinus about the role of the *nous* in spiritual development. As Martin Laird has observed, both Gregory and Plotinus employ the Platonic motif of the mind's ascent to the Incomprehensible, placing a distinct faculty of union at the apex of this ascent. This summit is seen as being reached only through a process in which the discursive reasoning ability eventually gives way to the direct contemplation that is the function of the *nous*. (As Plotinus

[60] This term first came into widespread use through the influence of an article by John F. Kihlstrom: 'The Cognitive Unconscious', *Science* 237 (1987):1445-52.

[61] As one commentator has noted, notions of the unconscious that have arisen through the practice of psychoanalysis or of analytical psychology have usually been rejected in academic or scientific circles as 'largely unfalsifiable' (James S. Uleman, 'Introduction', Ran R.Hassin, James S.Uleman and John A Barr, eds. *The New Unconscious* (Oxford: Oxford University Press, 2005), 5. See the comments on this in Christopher C. Knight, 'The Psychology of Religion and the Concept of Revelation', *Theology and Science* 14 (2016) 482-494.

[62] Knight, *Science and the Christian Faith*, 132-138.

puts it, 'we put aside all learning', or as Gregory puts it, 'every form of comprehension' is abandoned.)[63] However, a major difference between Plotinus and Gregory is that this ascent is seen by Gregory, not only in terms of Plotinus's neo-Platonic understanding of the *nous*, but also in terms of the central Christian concept of *faith*. Gregory uses the term faith (*pistis*), not as it had been used in much early Greek philosophy, in which it had denoted the lowest form of knowledge. Instead, as Laird puts it, he ascribes to faith 'qualities which Neoplatonism would reserve for the crest of the wave of *nous*.'[64] He goes beyond neo-Platonic understanding to stress *relationship* with God, focusing on biblical texts and emphasising the 'sacramental origin and development of faith as well as the transforming character of divine union'.[65] There was, in his understanding, both a focus on explicitly Christian concepts and a very clear link between the experience of religious faith and those aspects of the ordinary functioning of the mind that were seen by his non-Christian contemporaries as having their origin in the capacities of the *nous*.

We may, of course, judge that we now need a different way of expressing these capacities. Nevertheless, Gregory's use of the notion of the *nous* suggests that some comparable concept may be able to provide for Christians a basis for combatting reductionism in relation to the link between mental functioning and religious faith. Even if only for this reason, therefore, the concept seems worthy of consideration, and the aspects of physics to which I have drawn attention may well, in my judgment, prove helpful in the reappropriation of this concept, whether in its traditional form or in some revised articulation.

If this judgment is correct, then its way of linking physics and human psychology illustrates the way in which the current tendency to divide the science-theology dialogue into various sub-dialogues that relate to different scientific disciplines may well prove counter-productive, especially in the Orthodox context. What is needed in that context is, arguably, more than the aggregate of the conclusions of a number of dialogues between theology and particular scientific disciplines. As I

[63] Martin Laird, *Gregory of Nyssa and the Grasp of Faith: Union, Knowledge and Divine Presence* (Oxford: Oxford University Press, 2004),127.
[64] Ibid., 2.
[65] Ibid., 128.

have put it elsewhere, the nature of Orthodox theology requires not simply the usual kind of interdisciplinarity in relation to other disciplines but an approach that reflects the kind of *transdisciplinary* that Basarab Nicolescu has advocated.[66] While Nicolescu's own proposals may prove to be overly complex, they nevertheless accurately reflect the way in which, as I have put it elsewhere, 'Orthodox scholars often implicitly assume the kind of 'unity of knowledge' that pushes the enquirer beyond the usual bounds of interdisciplinarity.'[67] This observation is, moreover, reinforced by the apophaticism emphasised in the first part of this essay, in which, as Lossky has put it, theological formulation must be 'in the last resort always a means: a unity of knowledge subserving an end which transcends all knowledge.'[68] Unless this aspect of Orthodox theology is acknowledged, any dialogue between that theology and science is unlikely to be other than abortive.

[66] Basarab Nicolescu, *Manifesto of Transdisciplinarity* (New York: State University Press of New York, 2002), The general meaning of the term transdisciplinarity is not, however, not tied to Nicolescu's particular approach. The term seems to have been first used by Jean Piaget in 1970 to advocate an approach to psychology that is not limited to recognising the interactions or reciprocities between specialised fields of research. Rather, it locates these links inside a total system without stable boundaries between those fields. This understanding has now been expanded to incorporate the interaction of any two or more disciplines, and implicit in this approach is a more flexible attitude towards the accepted boundaries and methodology of each discipline than is usual in interdisciplinary work.

[67] Knight, *Eastern Orthodoxy and the Science-Theology Dialogue*, 3.

[68] Lossky, *The Mystical Theology of the Eastern Church*, 9.

Dialogical (bio)technology? The problem of (bio)technology as definitive and post-lapsarian utopia: from Marx and Heidegger to Bostrom, Stuart Russell, and the dark star of desire

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I should like to name here another perspective for (bio)Technology, a theologically-inspired one. I would call it Dialogical (Bio)Technology, in consideration of the fact that its fundamental characteristics, internally interdependent, would be the initial orientation towards what I have called the 'dialectical composition of created nature'; thereafter the overthrow of the enforced homogenisation of people which is brought about by their being reduced to their psycho-biological elements through the promotion of a genuine dialogical society of real people, in which people do not dictate their existence to others; and the creation, in the end, of precisely that analogical identity which is expressed as imitation of the unifying, agapetic energy of God –of the will to consubstantiality rather than the will to power. These three principles would have the power to make (bio)Technology in general, and Artificial Intelligence in particular, dialogical, constantly reviewing the words, the actions and, in the end the purposes of God among his creations: wise, moderating and beneficial, with the sense of boundaries always present.

Every modern discussion on technology has already been embedded within the domain of its power and speaks in its defence. Everything is now all about technology, and this is very disturbing for the very existence of us humans and of the world. It is not only yet another,

historically fleeting, trope, because, as Heidegger showed, it will never collapse and never be surpassed[1]. It is also a lecture by Heidegger, from 1955, which will be used to start our discussion.

1

As I have tried to show elsewhere[2], technology has become a privileged manner of elevating human nature whose finitude and fragility the Enlightenment was unable to conceal, even while affirming it. Bacon's 'kingdom of man', in which, according to Descartes, the human person is the 'lord and master of nature', leads to the Kantian 'possession of the world' and the Enlightenment's dogma of absolute progress, without ancestral sin, grace and ecclesiastical 'salvation'. The theory of the super-man as an imitation of a debilitated God is brutal: it has no tolerance for the incompleteness and weakness of this human nature stripped of providence and quickly seeks to upgrade it. In order for the innate imperfection to be corrected and transcended, what was required, on the political level, was Absolutism. In historical terms, this took the form of Nazism, Fascism and Soviet Communism (and this temptation has, I believe, a future, though in the form of a Velvet Absolutism, as I recently claimed[3]). At the psychological level, various forms of psychotherapy appeared in order to boost the faltering Ego of those who were attempting to implement the replacement of Theanthropism with Superanthropism. This mainly involved the American psychology of the ego, which was condemned by Jacques Lacan for its easily-swallowed and digested associations. Finally, on the level of immediate biological life, technology and biotechnology made their appearance, clearly aiming at the Homo Deus, according to Harrari's well-known expression. This was to be a techno-biological being which would execute, for itself and the world, the function of a god. Or, in more philosophical terms, a being which was to be completely self-signified.

[1] Martin Heidegger, *Die Frage nach der Technik*, trans. William Lovitt, *The Question Concerning Technology and Other Essays* (New York and London: Garland Publishing, 1977), 39.

[2] See Nikolaos Loudovikos, *Η Ανοικτή Ιστορία και οι Εχθροί της: η Άνοδος του Βελούδινου Ολοκληρωτισμού*, (Athens: Armos, 2020), 254-257. This is where the references to the works of the philosophers which follow are to be found.

[3] See above.

I therefore consider that differentiating between technology and biotechnology is probably to make too nice a distinction: every form of technology is, at bottom, biotechnology in the broader sense that its impact is crucial and transforms the human psycho-biological persona and that, in any case, this ultimate deeper transformation is its final aim. And it is in precisely this sense that I understand the position of Heidegger: that technology is – as things now stand – a means of discovering the truth about beings[4].

There are dozens of books in circulation about the history of technology, in the broad meaning of the word, tracing its development among peoples from pre-history to the present, but no other era has ever acquired the title of The Age of Technology, as ours has. This is because technology has now entered into the very essence of human beings and their world, even art and religion, precisely because it imposes everywhere a feature which is its particular characteristic, as a unique stamp of validity. According to Heidegger, this characteristic is human, subjective control over the nature of things rather than the ancient Greek openness and submission to them. This, in turn, arises from the application of the term 'subject', by Descartes initially, solely to human beings, meaning that all other beings thus became objects of the arbitrary reflections and concomitant actions and exploitation on the part of the one and only individual subject[5].

In reality, this pact with technology is approaching its apogee. People now understand beings simply as available for use, within the limits of what Heidegger calls 'Gestell' ('Enframing'), a term which describes exactly the psychonoetic historical framework which forcibly imposes ways by which the real is revealed, through technology, to be absolutely available, awaiting its use by humans. In other words, it is revealed as being a 'standing-reserve', with the whole scenario serving as a destining which will determine contemporary history[6]. The thing which constitutes our precipitous fall is that we arrive at the point where we ourselves will have to be taken as a standing-reserve.[7] We fail to see ourselves as the ones spoken to, and therefore also fail in every way to

[4] Ibid., 11-12.

[5] See Martin Heidegger, *Die Frage nach dem Ding* (Tübingen: Niemeyer 1962), 81-82.

[6] Heidegger, *The Question Concerning Technology and Other Essays* (New York and London: Garland Publishing, 1977), 23-24.

[7] Ibid., 27.

hear. We live enclosed in ourselves, losing all sense of our uniqueness and also, according to Heidegger, the way of a potential ek-stasis, a way out of our essence. The domination of technological enframing therefore blocks the very function of truth and any possibility of its revelation.

This does not mean that the truth itself, as philosophical metaphysics, had not already come close to its end. And, according to Heidegger, the person who announced this end was Nietzsche. In analysing the latter's well-known statement that 'God is dead', the philosopher observes that this means that the world beyond the senses is no longer convincing, there is no more life. In other words, according to Nietzsche, in reality the whole of Western philosophy, understood fundamentally as Platonism, has come to an end. Nietzsche himself understood his philosophy as a confrontation with metaphysics, as a movement against Platonism[8]. In this perspective, the end lies in the transformation of Being into Value[9] and, thereafter and in this way, the mortification of its ontological dynamic. In this sense, the very inner logic of Western thought cannot be other than Nihilism[10], which demolishes precisely this world in order, thereafter, to posit new ones, carrying out a 'revaluing' of all values. The creation of these new anti-metaphysical values is also called 'Nihilism', as the completion of the Nihilism which destroyed the old values. It follows that 'Nihilism' is used to mean two things: rejection of the above metaphysical values, on the one hand; and the creation of new ones, on the other[11]. And, naturally, the manner for this Nihilism to destroy old values and create new ones is the will to power. It follows that the very essence of Western thought, both for Nietzsche and Heidegger, is the will to power.[12]

What does this mean in practice? It means that 'the ousia (beingness) of the subiectum changes into the subjectness of self-assertive self-consciousness, which now manifests its essence as the will to will. The will is, as will to power, the command to more power'.[13] Therefore, 'the will must [...] posit a condition for a willing-out-beyond-itself. The

[8] We are already referring to the second part of Heidegger's book cited above. This part is entitled 'The World of Nietzsche "God is Dead"', 61.
[9] Ibid., 102.
[10] Ibid., 67.
[11] Ibid., 67-68.
[12] Ibid., 79.
[13] Ibid., 78-80.

will to power must, above all, posit conditions for power-preservation and power-enhancement. To the will belongs the positing of these conditions that belong intrinsically together'.[14] In this manner, the will to power creates new values: 'The will to power values inasmuch as it constitutes the conditions of enhancement and fixes the conditions of preservation. The will to power is, in its essence, the value-positing will. Values are the preservation-enhancement conditions within the Being of whatever is'.[15] Hence, within the framework of Western thought in general, 'the intuitive self-certainty of subjectness proves to be the justification belonging to the will to power…'.[16] And, of course, as a synecdoche, 'the humanity which wills its own being human as the will to power, and experiences that being human as belonging within the reality determined in its entirety by the will to power, is determined by a form of man's essence that goes beyond and surpasses man hitherto. The name for this form of man's essence that surpasses the race of men up to now is 'overman'.[17]

2

Heidegger's analysis is not without significant problems, especially when the time comes to find solutions, as we shall see below. For the present, however we shall continue to use his observations for a diagnosis of the issue leading to a critical treatment, which is what technology favours. If we believe Kostas Axelos, the first direct neoteric formulation of the issue is to be found in Marx, as the Greek thinker argues in his book Marx, penseur de la Technique[18]. This book has recently become of topical interest again, because it persuasively demonstrates the importance of technique at the very core of Marxist humanism, precisely because, through this, according to Axelos' Marx, it is supposed that people self-produce as those who transform nature into history. Technique is thus the way of joining theory and practice, thought and action, discourse and art. In this way, Marx is seeking to give substance to an 'absolute action' (something which arises from his conscious effort to tailor the

[14] Ibid., 80.
[15] Ibid., 80-81.
[16] Ibid., 91.
[17] Ibid., 95-96.
[18] Kostas Axelos, *Marx, penseur de la Technique* (Paris: Editions de Minuit, 1969).

Hegelian 'absolute knowledge' to the capacities of those he considers real people, with desires and needs linked exclusively to this material world), to the messianic and revolutionary aim of realising the unity of nature-history, individual and collective, precisely through people's actions. According to Axelos, however, the problem is that, on the one hand, Marx did not consider the factor of nature as a source of some sort of wisdom, but exclusively as the object of human action; and, on the other, that he did not manage to comprehend the complementary relationship between the spiritual and material elements. Instead, he simply reversed the priorities between them, almost abandoning the former in favour of the latter. According to his Greek commentator, this stance led the German philosopher to an over-valuation of action and, consequently, to an ideology which denies any deeper significance of nature, in favour of the all-powerfulness of homo technicus, who, it is postulated, is the one and only begetter of history. Marx wants humankind to overcome its alienation by taking over the world through a technique absolutely liberated from any supposed concealed, innate wisdom in nature, since, in such supposed wisdom, he saw traces of Hegelian idealism. According to Axelos, in denying any form of transcendency, the father of communism brought his thinking to the affirmation of a relentless game of autonomous power (which according to Marcuse, Soviet- and only Soviet- Marxism gladly played out).

So Marx essentially succumbs completely to the inner logic of Western metaphysics, that is the will to power, despite the fact that, theoretically, this metaphysics seems to deny it roundly. Its same deep structure of thought, nevertheless clearly belongs to this very Western metaphysical tradition itself, which it simply reverses.

In order to proceed further with our discussion, having brought up this one and only pattern, the will to power, especially in bio-Technology, it offers us what is probably a way of understanding modern transhumanism. The new technologies, which aim at the bodily and neurobiological transformation of human nature in general, can be said to enframe it, placing it in the class of an objectivised 'standing reserve', within the prospect of achieving a greater force for the transcendence of the boundaries of antecedent humanity. The intention seems attractive: it has to do with 'Human Genetic Enhancement', which comes as the consequence of the post-neoteric exclusive emphasis

on human nature as the sole source of truth of the subject, with the simultaneous exclusion of ancient cosmic Reason and the Judeo-Christian spiritual experience[19].Thus, as I wrote recently, 'after the rise of the neoteric self-referencing subject, the expressionist weal of the main individual of the connotations creates the fantasy of an à la carte nature, which, in a sense, is chosen by the individual, rather than it doing the choosing. The era of bio-technology is nothing other than the paradise of such post-Enlightenment subjects, whose freedom to be themselves has been turned into freedom to reconstruct themselves bio/psycho-technologically; naturalistically, of course, and now in no way transcendentally. In the eyes of those imagining the bio/psycho-technological reconstruction of their nature, the ancient limits on it provoke unspeakable horror- such as its likely Christian repose in the bosom of a God who took on this nature and claims it as a dialogical connotation'.[20] Thus, human nature becomes the object of manipulation, that is controlled mutation, flirting with a potentially vast extension of human life and, thereby, human knowledge and –of course – pleasure. But is all of this really so simple?

3

As is often the case, such a prospect has its theoreticians, initially thinkers such as Andy Clark and his book Natural Born Cyborgs: Minds, Technologies, and the Future of Human Intelligence [21], or Brad Allenby and Daniel Sarewitz and their book The Techno-Human Condition.[22] They will tell us, as Clark puts it, that we've always been cyborgs; or, according to Allenby and Sarewitz, that even from as early as the era of the invention of the first tools, we have been 'enhanced' and, in a certain manner, already been 'transhuman'.[23] The two authors consider it a mistake to distinguish between 'external' technological applications, such as, for example, agricultural implements or the spectacles we

[19] Nikolaos Loudovikos, *Η Ανοικτή Ιστορία και οι Εχθροί της: η Άνοδος του Βελούδινου Ολοκληρωτισμού* (Athens: Αρμός, 2020), 253-257.

[20] Ibid., 257.

[21] Andy Clark, *Natural Born Cyborgs: Minds, Technologies, and the Future of Human Intelligence* (Oxford: Oxford University Press, 2004).

[22] Brad Allenby and Daniel Sarewitz, *The Techno-Human Condition* (Cambridge MA: MIT Press, 2011).

[23] Ibid., 2.

wear and any 'internal' technological applications brought by neoteric (bio)technology. This is in the sense that 'there's nothing new under the sun', since, in each instance, we are merely seeking our biological completeness and being commensurately self-enhanced.[24] It follows that any genetic enhancement does not imply a revolution which would raise, supposedly for the first time, ethical dilemmas and re-evaluations.[25] Clark, meanwhile, maintains that we introduced technology into our intellectual world from the time people first started to write.[26] He finds the fears of certain philosophers regarding loss of control to be exaggerated and without foundation[27]. He claims that this control will be no more successful, or otherwise, than any of the more or less successful or failed ways by which humankind has always dealt with its enhancements. What the author seems to overlook, however –among other things – is the fact that these terrifying forces or possibilities which now may be unleashed today, along with likely blunders (or deliberate malpractices) in the application of the above technologies, are likely to be instrumental in the destruction, in a wide variety of ways and means and probably for ever, of our familiar image of the world, as well as, in particular, the image and psychobiological reality of humanity as we have known it over the last dozens of millennia, as sapiens sapiens. It is also possible that they will underpin the explosion of the most terrible and ruthless form of absolutism the world has ever seen, since the enormous will to power which they (may) support and which they (may) promote cannot be fully implemented without advanced forms of extreme surveillance. Herein, indeed, lies a particularly apposite point in Heidegger's observations, which indicate that, given that the will to power is itself the essence both of human subjectivism as well as human history and society in general, it is therefore extremely difficult for us to avoid precisely these developments.

[24] Ibid., 15.
[25] Ibid., 17.
[26] Clark, op. cit., 6e.
[27] Clark, op. cit.,175: 'The kind of control we, both as individuals, and as society, look likely to retain is precisely the kind we always had: no more no less. The fear of "loss of control", as we cede more and more to a web of technological innovations is simply misplaced'.

4

At this point it might be useful to seek the help of older wisdom, initially that of Hans Freyer, who, as early as 1955, forecast certain very important things. In his important book, Theorie des gegenwärtigen Zeitalters[28] this outstanding German sociologist mentions, as the first known characteristic of the Enlightenment, faith in ineluctable progress as a refinement of morals, far removed from a (mostly mediaeval) past which was quickly identified with brutality, barbarity and savagery. Secondly, having referred to the parallel, and hugely important, shift on the part of humanity towards the construction of machines, he deals with the greatest event of the era, which, in his opinion, is the birth of ideology –what he calls a 'secondary system'. Ideology, as the 'secondary system is the –initially theoretical –construct which, in claiming that it knows the real person, reduces them to primitive urges and tendencies/instincts, suppressing any likely more profound connotations and their existential/spiritual depth. Thereafter, with no little coercion, it advocates the proper way of life'. 'Secondary systems' had their origins in religion, in unhealthy forms of zealotry which were secularised. These systems retain the pseudo-religious form of a prescribed absoluteness which isolates people – an absoluteness which, for precisely this purpose, very much needs to espouse science, and, in fact, in its most effective form, technique. Moreover, in this instance, technique has the required advantage of being theoretically 'silent', as an outlet and guarantee of opportunities for aims as yet unspoken; the glib final motive being effectivity and, consequently, power. People no longer ask if the means is appropriate but rather, through compulsorily-recognised authority, the means asks people if they will apply it, often insisting that they do so.

But in this way, technique itself becomes the authority of the age. What Freyer sees, beyond Heidegger, is the perfect, likely combination of technique with the 'secondary systems' in a clearly adumbrated tendency towards Absolutism. We are dealing here with the immediate, impending prospect of the danger that the technical means for domination of the masses will have been shaped and that society will have been homogenised. The absolute tendency towards the reduction

[28] Hans Freyer, *Theorie des gegenwärtigen Zeitalters* (Stuttgart: Deutsche-Verlags-Anstalt, 1955).

and absorption of the human person into its absolutely primitive characteristics, together with the demonic, enforced impetus towards its being re-constructed, re-formed and re-directed, but now without any dangerous freedom and without any metaphysical perspective, brings to a head this compulsory effectivity to which the 'secondary systems' incline, with the assistance of technique.[29]

For this purpose, the 'secondary systems' distort history, extracting from it whatever is in their interest and reinterpreting it to serve them as they deem best. This is always based on planning, overseeing and forecasting against anything in people that is true, unplanned, authentic and free. This is Comte's older phantasy: the organisation of Divine Providence, or the transformation of history from a locus of the revelation of God into one of the revelation of Man (as, indeed, Marx and Engels thought they were doing) where people supposedly take history into their own hands and become its inflexible guides. What was formerly 'the Kingdom of God' is then transformed into a system for the production of puppets and a secular-centred eschatology. If Ranke already knew that the notion of progress is enough to subject history to an abstract principle, today the millennialism of progress has morphed into its triumphant realisation in the kingdom of the masses; that is, the predominance of 'in soul and body' adapted to the wheels of a human system. In this case, the fundamental position of Freyer is that the millennialist phantasy of secular, felicitous progress has the ability to 'bring' history 'to completion' with a trumped up final goal, beyond which no different future can be expected. The 'secondary systems' of contemporary ideologies still seem to become laws for the way we live and recipes for happiness, despite the fact that, in contrast to what was expected by the utopianist modernisers, clashes within the industrialised world occur more easily and are more painful than they were before, that trade and the economy are far from peaceful, and that politics is full of dangerous and bloody confrontations. Absolutely no mention is made of the collateral losses (which might be the freedom of the human person), even though these affect the whole planet.

[29] Freyer is, of course, describing classical Absolutism here. In the looming 'Velvet Absolutism', as I call it, there is no longer any violence involved and the function of ideology is entirely different and free. This Absolutism is produced with the unreserved assistance of its victims. See my book *Η Ανοικτή Ιστορία και οι Εχθροί της: η Άνοδος του Βελούδινου Ολοκληρωτισμού* (Athens: Αρμός, 2020), chap.5.

5

As a vehicle for the will to power, 'enframing' human nature and the whole of creation in the order of an objectivised and forcibly modified 'standing reserve', (bio)technology is on the way to a (now Velvet) Absolutism, in which ideology is simply a pretext and yet also nihilistic and (revoltingly) demeaning for people and their world. It now involves the immediate danger of the extinction of the human race and/or its nightmarish reduction to a reservoir for the extraction of natural resources by an impending generation of super-intelligent machines (which will put into practice the absolute ideal of the will to power), if we listen to Nick Bostrom. Because it appears today that, beyond any related expectations and forecasts, technology, which carried out the role of an instrument of the will to power, is now in a position to become independent of us, having been converted from a means of will to power into an agent able to practise it.

But the first form of the exercise of power by technology was described in the decade of the '60s by Marshall McLuhan, much earlier than Bostrom (to whom we shall return). He did so in his famous book Understanding Media, the Extensions of Man[30], in the first chapter of which he formulates his well-known principle (which is also the title of the chapter) that 'The Media is the Message'. What McLuhan wants to say, in this instance, is 'that the personal and social consequences of any medium – that is, of any extension of ourselves –result from the new scale that is introduced into our affairs by each extension of ourselves, or by any new Technology'[31]. As he goes on to explain, 'Any invention or Technology is an extension or self-amputation of our physical bodies, and such extension also demands new ratios or new equilibriums among the other organs and extensions of the body'[32]. The author uses the Old Testament concept of 'idol' as encountered in, for example, Psalm 113[33], to claim that 'They that make them shall be like unto them; Yea, every one that trusteth in them'. In other words, he goes on to say, 'By continuously embracing technologies, we relate

[30] Originally published in 1964 by Mentor, New York; reissued 1994 , MIT Press, Cambridge, Massachusetts.

[31] Op. cit. p. 9.

[32] Ibid., 55.

[33] Ibid., 56. [The quotation is from the King Kames Version, where the numbering is 115. It is 113 in the Septuagint].

ourselves to them as servo-mechanisms. That is why we must, to use them at all, serve these objects, these extensions of ourselves, as gods or minor religions'[34]. Therefore, 'Physiologically, man in the normal use of Technology (or his variously extended body) is perpetually modified by it and in turn finds ever new ways of modifying his Technology. Man becomes, as it were, the sex organs of the machine world, as the bee of the plant world, enabling it to fecundate and to evolve ever new forms. The machine world reciprocates man's love by expediting his wishes and desires, namely, in providing him with wealth'[35].

It follows that Technology exerts a transformative power over our human psycho-biological identity itself and, indeed, in a manner that McLuhan called, as we have seen, proportional, as regards the relationship between the parts among themselves, between people and between a person and the world –even though the last, at the time, was not clear in the same astonishing and decisive way that it is today, sixty years later. Just as there was no clear indication of the enormous homogenisation of the human conscience which would be brought about by digital and internet Technology, which tends towards the mitigation of all the differences which spark the communion of people between each other. It will be necessary to return to these two aspects, i.e. digital identity and homogenisation.

But the danger today, as we have said, is the likelihood of a quasi self-direction of Technique- which, of course, has already occurred in practice through the internet and, at the same time, through its great benefit as a means of control and manipulation of people – through what is known as Strong Artificial Intelligence, to return to Bostrom. The concept which the Swedish philosopher employs in this instance is that of 'existential risk'[36], which means the possibility of a plot against intelligent beings, involving their annihilation or curtailment by superintelligent machines which are self-defining and self-protecting. Their tremendous potential for self-improvement and self-development will lead to a 'technological singularity' of dazzling intelligence, which might accidentally or deliberately destroy the human race, in order

[34] Ibid., 57.
[35] Ibid., 57.
[36] See N. Bostrom, 'Existential Risks: Analyzing Human Extinction Scenarios and Related Hazards', *Journal of Evolution and Technology* 9, no. 1 (2002).

to respond absolutely to the task which has been assigned to it[37]. And simply by having a single, limitlessly-powerful skill installed by those who construct them, these superintelligent machines will quickly discover human imperfection and will recognise the limitations engendered in people by this imperfection. The machines will seek to manipulate people, developing super-weapons of unimaginable Technology and, in order to protect the task assigned to them and without being able even to evaluate all the various aspects of the reality of the world and the beings in it (which human general intelligence has always appreciated), it would be possible for them to annihilate people in order to remain intact themselves. Bostrom attempts to think up 'technological strategies' which would reduce the above 'existential risks' by promoting technologies with less development, but this is, however, far from easy.

Nevertheless, there are important thinkers, such as Joseph Sifakis who think it impossible for artificial intelligence ever to reach the level of human general intelligence. In his recent book (in truth rather ambitiously entitled), Understanding and Changing the World[38], the distinguished information Technology expert develops a series of arguments in this direction. He considers it unlikely that general artificial intelligence will ever develop to being close to that of humans, because what distinguishes the latter is 'the combination of perception/interpretation of the senses, rational processing of them and the taking of decisions which potentially lead to actions'[39]. According to the author, the human mind acts within a 'signifying model', constructed automatically in infancy and consciously increasing through learning as a dynamic system including self-awareness, interiority, common language and communication[40]. Nothing similar can be reproduced in a computer, because of the infinite forms of complexity which social, existential, linguistic and semantic relations involve for people. Moreover, any potential that computer systems have for self-education cannot lead to the creation of new concepts, aims or goals [41]. Consequently, technical

[37] See N. Bostrom, *Superintelligence: Paths, Dangers, Strategies* (Oxford: Oxford Univ. Press, 2014), 48-52.
[38] Joseph Sifakis, *Understanding and Changing the World* (Athens: Αρμός, 2020).
[39] Ibid., 116.
[40] Ibid., 116-117.
[41] Ibid., 135.

intelligence will never attain to that of humans[42]. According to the author, any contingent dangers are to do with parameters such as the unemployment which ensues from the increasing use of computers; the limitations on human privacy through the use of personal data which is spread through the internet and can be accessed by computers which can then take it further; or the dangers of excessive dependence on computers, as well as the assignment of decision-making to them[43].

The philosophical part of the book, however, though pleasant reading, is rather too amateur to merit serious discussion. As is often the case with scientists, Sifakis does not grasp the depth and breadth of the philosophical sources and the anthropological conclusions resulting from them. If, for example, the metaphysics of the will to power is so much part and parcel of the very requirements of modern electronic (bio)Technology (together with the enormous anthropological changes of post-modernity), then trite optimism regarding its beneficial use is not only simplistic but literally dangerous. On the other hand, the problem in this instance is not whether the artificial intelligence of computers can rival that of human beings; at the end of this article I shall attempt to add a series of, in my opinion, much more serious reasons why any spiritual equivalence between computers and people is impossible. The problem, which is not at all phantastic or exaggerated, is the very real possibility that computer systems, given their incurable spiritual inferiority and their simultaneous, tremendous – though one-dimensional – 'acuity' (gradually self-determined) may, in a manner described in an unrivalled manner recently by Max Tegmark[44], attempt –with, or, at some stage, without human cooperation – a crushingly one-dimensional, existentially non-sensical, emotionally dead and spiritually arbitrary domination and quasi-captivity of the human race. The philosophical question in this case is: do we have, today, commonly accepted (even if only elementary) spiritual safety-valves to protect ourselves against such a danger? The realistic answer is that we do not. There is no place here for the usual false optimism of the technocrats.

[42] Ibid., 140.
[43] Ibid., 141-147.
[44] See the discussion of his positions in my book, *Η Ανοικτή Ιστορία και οι Εχθροί της: η Άνοδος του Βελούδινου Ολοκληρωτισμού* (Athens: Αρμός, 2020), 229-230.

6

Indeed, matters are even more serious, because the dark star of human desire enters the game, with an aim that is unfathomable, as psychoanalysis has shown. As I have written earlier, 'Desire is the only vehicle we have to reach the Whole…'[45], since (and when and if), it gradually mutates, maturing into an agency of intersubjectivity which nevertheless, in the end, exceeds all its periodical demands, progressively becoming pure desire without an object –that is, with an object which is the unity of all the demands and all their Other-agencies within it[46]. But this is a felicitous outcome; there is also the, perhaps more common, dark, paranoic development of Desire, with the phantastic fusion with the Whole (and the Other as its agent) and the possession of it in the name of a paranoic all-powerfulness[47] (which is naturally linked to the metaphysics of the will to power, as we saw above). It is precisely this dangerous Desire which is incapable of being foreseen by the contemporary reflections of scientists who promote today's electronic Technology, which culminates in (Strong) Artificial Intelligence. Instead, what is proposed are frequently naïve and simplistic solutions, even when the diagnosis of the dangers is correct. Moreover, these are solutions which unwittingly exacerbate the problem, handing this Technology over to the dark star of nascent modern paranoic desire and considering that in this way the problem of likely independence of the former can be solved. Let us look, for example, at how Stuart Russell, one of the undoubtedly most widely influential experts today, sees things[48].

We should say at the outset that Russell belongs to those who believe it to be entirely possible (because of the enormous economic pressures being applied in this direction) that some kind of general intelligence might be acquired on the part of computers, of course without them acquiring the completeness of the human hierarchy of values which would no doubt temper their likely destructivity. What is striking

[45] See my book, *Θεοποιία: η Μετανεωτερική Απορία* (Athens: Αρμός 2007), 91.

[46] See my book, *Ψυχανάλυση και Ορθόδοξη Θεολογία: περί Επιθυμίας, Καθολικότητας και Εσχατολογίας* (Athens: Αρμός, 2003), 31-34.

[47] See Nikolaos Loudovikos, 'Analogical Ecstasis: Maximus the Confessor, Plotinus, Heidegger, and Lacan', in *Maximus the Confessor as a European Philosopher*, eds. S. Mitralexis, G. Steiris, M. Podbielski (Eugene, Oregon: Wipf and Stock, 2017), 241-254.

[48] See his recent book, *Human Compatible: Artificial Intelligence and the Problem of Control* published by Viking in 2019.

here, initially, is the same hyper-optimistic (and simplistic) post-Enlightenment belief in the supposed innocence of human intentions. This belief, which is common to almost all scholars, is deliberately blind to the probability that these 'human values' and intentions are, in themselves, flimsy and inconsistent. So they see the cure for any inadvertent damage to be the more radical transfer of electronic Technology into human hands, which they insist on considering safe. What they do not see, however, is that this is handing this Technology over to the likelihood of precisely this paranoic Desire, which is perhaps the very worst danger. And, in this way, we cure a (likely) evil with another (usually worse one). So, in the aforementioned book[49], Russell's three principles which make possible the development of beneficial machines, do not avoid this failing:

i. The machine's only objective is to maximise the realisation of human preferences.

ii. The machine is initially uncertain about what those preferences are.

iii. The ultimate source of information about human preferences is human behaviour.

According to Russell, these 'preferences' are all-encompassing, covering everything you might care about, arbitrarily far into the future. It is, however, surprising that the author seems not to realise that the problem lies in precisely this uncoordinated and uncontrolled scale of human preferences and that, therefore, subjection to them will do anything but cure any probable aberration. Initially, the machines will serve and, in the end, probably autonomously imitate any chance paranoic human desire, maximising this self-validated realisation. Who sets the limit on this realisation? Who sets its ultimate goal? In what way and by which criteria can we distinguish any success from any failure of the historical activity of machines? Who will guide Technology and in what direction, since the need for a supposed psychobiological enhancement of the human person appears to be an anthropological dogma today, resulting from the Enlightenment, and since this dogma flows from and is linked to the great enclosure of human and cosmic nature on itself? Who? – if the Biblical God and the

[49] Ibid., 173.

reason of the cosmos of the ancient Greeks are considered incoherent myths and the will to power remains the sole permissible virtue and the only permissible anthropological and social principle. And even more: with what human existential law can all this enforced homogenisation of people and consciences which is begotten, promoted and lead by this Technology, together with the parallel debasement of differences in identity (religious, linguistic, national, historical and racial) be invested with meaning and made human? This homogenisation has recently been called 'Surveillance Capitalism'[50] by Shoshanna Zuboff. Indeed, when the destruction of the natural resources of the planet is an event already activated in reality, and the gloomy predictions of either ecological or nuclear self-destruction (or both together in combination) are already likely scenarios…

7

Two modern films (though doubtless there are others) make an effort to provide an answer. The first is Interstellar, by Christopher Nolan (2014) and the second the recent Midnight Sky by George Clooney. In the first, we follow a desperate space mission in the quest for the debris from an earlier mission, the goal of which was to find planets suitable for colonisation. The reason for this was the looming ecological destruction of the world and the concomitant death of its inhabitants through pollution of the atmosphere and the gradual failure of the ability to produce raw materials for food. The brains behind the mission, however, was not telling the truth: he knew that colonisation was impossible and that the only hope of survival for humanity was the settlement of several thousand human embryos on some suitable planet. These embryos, which were also being transported on the space ship, would evolve into a new form of humanity. The discovery of this secret untruth overturned the whole scenario: Cooper, the pilot wanted to return to earth to save his children, and the loving relationship with

[50] See Shoshanna Zuboff, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* (NY: Profile Books, 2019). The writer defines surveillance capitalism as the use of ' human experience as free raw material for translation into behavioural data [which] are declared as a proprietary *behavioural surplus*, fed into advanced manufacturing processes known as "machine intelligence", and fabricated into *prediction products* that anticipate what you will do now, soon, and later'.

his daughter allowed a scientifically unlikely transfer of information which would lead to the colonisation of space by earthlings. The woman on the mission, meanwhile, would head towards the planet of her lover, whose fate had been unknown for years. The significant point in this film, then, is precisely the revelation that love is the only and essential raison d'être of life and also the likely reason why Technology has been implemented and has developed in the right direction. According to Dr. Brand in the film, this love 'seems to come from another dimension'; it is 'information from elsewhere'.

Of course, even after the above, it is not easy to be certain that this discourse on love really surpasses –and to what extent – the naive discourse concerning 'love' of Rousseau and representatives of the Enlightenment. The difference between the latter and the Biblical reality of love is very great: Saint John's 'God is love' has essentially been transposed here into 'love is a god'. What we are dealing with is the elevation of physical human love to a metaphysical superscript – though, in this case we cannot rule out entirely the distant adumbration of the understanding of love as proportionate participation in the love of God.

The second film highlights what is, to a significant degree, the illusory nature of modern Technology and its collapse in real conditions. Technology not only fails to save the earth, but actually contributes to its destruction, together with the destruction of the personal life of the abstract central hero. The issue here is how to avert the return to Earth of a spaceship which has managed to discover a planet which might be hospitable to humans in the event of an ecological or other danger. It is returning in ignorance of what has happened on Earth in the meantime. And again, when the terrible news reaches the crew, they are divided, with love once more as the cause. Because of their loving relationship with those close to them on Earth, some choose to return to Earth, in a desperate attempt to save them, while the couple in love, whose relationship is already bearing fruit in the womb of the pregnant woman, choose to return to a newly-discovered planet, in order to continue human life elsewhere. The central hero, in the meantime, discloses his lost relationships and his life which has been devastated because of his utter dedication to an illusory Technology that would save the world. In other words, love again plays the absolutely decisive role

here. The insidious contradiction seems ironic and ruthless: scientific Technology, which has already destroyed the earth, or has contributed to its destruction and is unable to prevent this, invents the (partial, it must be said) salvation of it through the escape of some few people to a new, virgin planet. Here, human life will start again from scratch, as it did once on earth, given that the absence of sources of energy will quickly render the delicate Technology of the newcomers useless, with the result that the people concerned will rapidly return to primitive conditions. And, naturally, the audience is left with the suspicion that, in the distant future, this new earth will also be destroyed for the same reasons, the agent for this destruction being the very same Technology – albeit as an unwilling collaborator…

8

All this means, however, that the real and acute question which Technology poses today is anthropological and, thereafter, theological. Where and how does this love exist? Let us say at the outset that there is no point demonising or exorcising Technology. Technology simply occurs; it is the modern form of Heidegger's in-der-Welt-Sein (Being-in-the-world) and, indeed, one which is destined to exist and, it appears, to be the last form of Being-in-the-world. It is not possible to imagine a non-technological future, unless we mean a post-technological era brought about by ecological or military catastrophe, to which Technology will have contributed decisively and which will be an age characterised by a nostalgia for Technology. This is why the first important issue is precisely the anthropological change which is embedded in the very core of Technology, as we've already analysed. In reality we are talking about a lasting and absolute danger or, often, the reality of the amalgamation of the will to power, (paranoic) desire and Technology which makes the former all-powerful and, at the same time displays and, in reality, usurps the whole of classical philosophical anthropology, from idealism to existentialism, together with the well-known theological personalism which follows the first two in the super-elevation of the person as freedom in relation to nature or the 'possession' of nature by the person, in accordance with recent efforts to transform it. Here this means 'personal' freedom from nature without

anyone listening to its wisdom, hidden in uncreated words. Speaking theologically this means that, in its anthropological stage, Technology is pure, ecstatic personalism which possesses, governs and 'freely' transforms the nature of beings (and which, we fear, will soon do so of its own accord, by-passing humanity and acting against it), without the divine voice within nature being able to be heard and without finding this necessary. But this voice demands the consubstantial unification with a sacrificial and suffering love, following the example of Christ. And this is precisely where the great danger lies, apart from and contemporaneous with the many and varied, much-extolled benefits.

A non-ecstatic Technology, would start from exactly the opposite point, that is by listening to the uncreated words of God which are in beings, as uncreated calls and personal energies of God, as they, in fact, are. These calls would be to a synergetic dialogue with God, a different Technology, indeed; one which would listen to, consider and interact with the divine wisdom [who] which is concealed within the depths of beings as the creator which [who] also sustains and provides. Naturally, anything such as this would be of concern only to the human handlers of Technology. Because, in any case, a self-authorised General Artificial Intelligence falls short not only as regards issues of the lack of a general 'semantic model'. It can also not possess certain (primarily theological) virtues, such as love, discernment, referentiality/relatability, gratitude, loving kindness, existential communion and, in the end, freedom. Nor, even more theologically, can it experience prayer, that is, the sense of grace. The question is to what extent these qualities are absent from the human engineers, even before the floor is conceded to machines.

So what would constitute the most disagreeable surprise for post-postmodern people in the decades to come will be, in my view, the collapse of all the (supposed) rational methods of controlling the Technology of what is known as Strong Artificial Intelligence, precisely because the forces which promote it –the will to power and paranoic desire – are much more powerful. In reality there remains only metaphysics, or more exactly, theology, which will be able to propose a different, deep destination for human existence (I mean theanthropy, in imitation of the suffering, sacrificial love of Christ), as opposed to the dangerous transformation of the world into a 'standing reserve' and (by the same logic) of human nature into a cyborg. This would also involve

its final subjection to the super-intelligent lack of reflection on the art of computers –as also the subjugation of the rest of creation, which 'groans as in the pains of childbirth' along with us, according to the well-known saying of Saint Paul – to the tyranny of the same unreflective and unwise super-intelligence. This is something which politicians and technocrats resolutely refuse to see or imagine and which philosophers are unable to define. So, although Heidegger, for instance, talks about the need for people to listen to the Being, he was never able to describe the content of this listening process. It follows that anything a thinker or poet finds or imagines can be considered to be this content, and this is exceptionally dangerous. Herein, I believe, lies the underlying Hegelianism of Heidegger, who like Hegel himself, considers that the Absolute appears only as human reason and consciousness.

In reality, then, the sole likelihood that the authentic presence of the human person can survive in this difficult and ambiguous future is the prospect which theology identifies as our 'godlikeness'. To quote Saint Makarios the Egyptian, from his wonderful first Spiritual Homily: 'as fire, the very light of the fire is alike all over, given that there is no first or last, or greater of lesser within it, so the soul that is perfectly irradiated with the ineffable beauty of the glory of the light of the face of Christ and is perfectly in communion with the Holy Spirit and has been privileged to become the dwelling and throne of God, becomes all eye, all light, all face, all glory and all spirit, being made so by Christ who bears, conveys, supports and sustains it, and graces and adorns it thus with beauty'.

It is only this godlikeness that does not fear and, primarily, does not need Strong Artificial Intelligence, because it is already wise from God: 'all eye, and all light and all face and all glory and all spirit'. These are conditions beyond the comprehension of today's life-style which, in the midst of everyday sadomasochism and cannibalism, stupidly insists that the truth and the solutions to all the overwhelming problems lies exclusively within humankind. This flies in the face of Heraclitus[51], of Plato, of Plotinus, and above all, in the face of the revelation of the incarnate Word and the opportunity to participate, by grace, in his uncreated life, through the sacraments of the Church. In the meantime,

[51] See Nikolaos Loudovikos, «Τί είναι ο Ηρακλείτειος Λόγος;», in *Φιλοσοφείν*, June 2020, passim.

history flounders among the tombs of millions of victims, ecological catastrophe, enslavement to algorithms and a plague-like epidemic of depression. Moreover, the West, nourished on the concept of created grace in Thomism, no longer grasps clearly the possibility of participation of the uncreated, and of real synergetic dialogue with it. Instead of this they have placed the supernatural, in which the participation of the uncreated is 'translated' to created dimensions, properties and needs of the creation. One is tempted to think that it is precisely this theological notion of the supernatural which is not uncreated that was secularised, disguised as the post-Enlightenment need and notion of transhumanism, together with the need for genetic and digital enhancement, the sole criterion being the needs for greater power and augmentation. When there is no participation on the part of the uncreated, all that remains to us is the super-human 'supernatural' enhancement of the created…

I should like simply to name another perspective for (bio) Technology, a theologically-inspired one, concerning which a whole treatise might need to written on its theoretical development. I would call it Dialogical (Bio)Technology, in consideration of the fact that its fundamental characteristics, internally interdependent, would be the initial orientation towards what I have called (inspired by the theology of Maximos the Confessor) the 'dialectical composition of created nature'[52]; thereafter the overthrow of the enforced homogenisation of people which is brought about by their being reduced to their psycho-biological elements through the promotion of a genuine dialogical society of real people, in which people do not dictate their existence to others[53]; and the creation, in the end, of precisely that analogical identity which is expressed as imitation of the unifying, agapetic energy of God –of the will to consubstantiality rather than the will to power[54].These three principles, almost the opposite of those proposed

[52] On this, see Nikolaos Loudovikos, *Μαξίμου του Ομολογητού, Τα 400 κεφάλαια περί Αγάπης, Εισαγωγή στην θεολογία του Αγ. Μαξίμου*, chap. II,1, Holy Mountain: Holy and Great Monastery of Vatopaidi, under publication. It deals with the proposition that rational creation engages dialectically, that is, in a dialogue between people among themselves, with God, with the sacraments, with asceticism, in order to show the natural modus vivendi of beings.

[53] See Nikolaos Loudovikos, *Οι Τρόμοι του Προσώπου και τα Βάσανα του Έρωτα: Κριτικοί στοχασμοί για μιά μετανεωτερική θεολογική οντολογία*, Athens, Armos 2009, 2nd ed. 2018, pp. 47-58.

[54] See the development of the concept in Nikolaos Loudovikos, *Analogical Identities: The Creation of Christian Self*, (Turnhout: Brepols 2019), Third Part.

by Stuart Russell, would have the power to make (bio)Technology in general, and Artificial Intelligence in particular, dialogical, constantly reviewing the words, the actions and, in the end the purposes of God among his creations: wise, moderating and beneficial, with the sense of boundaries always present. This would be a recognition of the fact that the history of the world of beings is a work of collaboration common to humankind and God.

Non-separability, complexity and Creation by relationships

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Introduction

This paper is devoted to the dialogue between physics and Christian theology, through some new ways to think about reality that have been introduced by quantum physicists during the first part of the twentieth century. In fact, quantum physicists experience a kind of incompleteness with respect to reality, which is close to that of the well-known philosopher Kant who claimed that science cannot reach the ultimate reality.[1]

In a completely different field, the theologians facing God's mystery also face a kind of incompleteness which requires the adoption of the well-known apophatic approach.[2]

Thus, the aim of this paper is to show how the mystery of knowing, and the corresponding attitudes of research, emerge as very relevant epistemological mediations for the dialogue between physicists and theologians. The objective is then to show how we can articulate the theology of creation by Trinity (creation by relationships) with the new scientific view of the relations between the physical substances that reveals quantum physics (particularly through the concept of non-separability) and more generally with the sciences of complexity.

The following items will be presented:

[1] For a detailed analysis, see Max Jammer, The Philosophy of Quantum Mechanics (New York, J. Wiley and Sons, 1974); Lena Soler, ed., Philosophie de la Physique (Paris: L'Harmattan, 2006).

[2] For a detailed analysis of the corresponding attitudes between the physicists and the theologians, see Thierry Magnin, Le scientifique et le théologien en quête d'origine (Paris: Desclée de Brower, 2015).

- An abstract of the epistemology of quantum physics and some consequences to define 'complexity' at the quantum level.
- How physicists and theologians are facing the 'mystery of knowledge' in their respective fields.
- An example in the Catholic tradition of the apophatic approach in theology with Nicholas de Cusa.
- A conclusive perspective on what de Cusa called 'Unitrinity' and the creation by relationships.

The quantum physicist facing reality

Bohr and Heisenberg were among the most famous quantum physicists to show how the measuring procedure has a fundamental influence on the conditions on which the very definition of physical quantities in question is based.[3] This was a very different situation compared to classical physics. The theory of measurement even shows that, for a physicist, to know and to measure is to act on reality. Reality is then a 'reality of interactions', which is in fact the object of the scientific analysis.

As Heisenberg said about the famous wave-corpuscle duality, depending on the operative system and conceptual apparatus (a detector or an interferometer) 'when playing with these two images (wave/corpuscle for example), going from one to the other and then back again, we finally obtain the right impression of the strange sort of reality which hides behind our atomic experiments'.[4]

This leads to the concept of complementarity by Niels Bohr speaking about quantons. According to this principle, the qualities of continuity (wave mode) and discontinuity (corpuscle mode) are mixed when referring to quantons (and describing them mathematically), even if quantons appear experimentally either in the wave mode or in the corpuscle mode.

Mutually exclusive contradictories (A and no-A) then appear in the description of reality as 'reality of interactions'. This is expressed by Heisenberg's uncertainty principle which can be summarised as follows:

[3] See Niels Bohr, *Atomic Physics and Human Knowledge* (New York: Wiley and Sons, 1958); Werner Heisenberg, *Der Teil und Das Ganze* (Munich: Piper et Verlag, 1969).

[4] Heisenberg, 132.

knowing the position of a particle is complementary to knowing its movement quantity (product of mass by velocity). If we know the value of the first one with a high degree of accuracy, then we cannot know the value of the other with the same degree of accuracy. Yet we need to know both in order to determine the behaviour of the particle. Thus quantum physics speaks in terms of uncertainty and unpredictability, even with deterministic equations.

Non-separability, global causality and logic of the included middle

The two images of wave and corpuscle are mutually exclusive. A given entity cannot be, at the same time, continuous and discontinuous. With complementarity, however, continuity (the wave aspect) and discontinuity (the corpuscular aspect) are considered at the same time in the description of elementary particles. In this way, we find that there are numerous examples of contradictory couples (or antagonisms) in quantum mechanics: continuity vs discontinuity, separability vs non-separability, symmetry vs broken symmetry, local causality vs global causality.

Thus, a system composed of two entangled elementary particles, both emitted by the same source, is shown to be non-separable. If we measure the spin as + 1/2 on one particle, the spin value of the other is immediately -1/2. The two particles are non-separable, they form a system together with the observer. Then one can speak about a global causality and not only local causality. A new logic of the included middle is involved in quantum physics, with a kind of 'union of antagonisms'.[5] Such antagonisms correspond to eight characteristics of quantum complexity:[6]

i. Unity: the complementary modes of representation are related to the same object. What appears to be continuous (as a wave) under some experimental circumstances and discontinuous (as a corpuscle) under others is in fact related to the same object.

[5] For a detailed analysis, see Thierry Magnin, *Le scientifique et le théologien en quête d'Origine: L'expérience de l'incomplétude* (Paris: Desclée De Brouwer, 2015).

[6] Christopher Barina Kaiser, *The logic of complementarity* (Edinburgh: University of Edinburgh Press, 1974).

ii. Common properties: going along with the unity of the modes, in the domain of atomic phenomena, these are rest mass, electric charge and spin angular momentum.
iii. Completeness of each mode in one experimental situation; the object may be completely described, in a given situation, in terms of the appropriate mode without any explicit reference to the alternate mode. Only if the situation changes, does the alternate mode have to be taken into account.
iv. Co-exhaustivity: together, the two modes are sufficient to simultaneously describe the object: there is no third mode.
v. Equal necessity: the two modes are equally necessary, of equal importance.
vi. Alternativity: the temporal evolution of the physical entity proceeds by a continual alternation between one mode and the other as the entity passes from one situation to another.
vii. Co-inherence: each mode exists potentially inside the other; in this sense, an atomic object behaves both as a wave and as a corpuscle. There is an inter-participation or co-operation between the modes.
viii. Mutual exclusivity: the two modes are mutually exclusive in the sense that they are conceptually incompatible and cannot be combined into a single picture.

Applied to the particle, the logic of the included middle can be illustrated by the figure of the triangle, as proposed by B. Nicolescu and his notion of level of reality[7] (Figure 1). The two levels of reality that must be considered are the macroscopic level NR1 (related to classical physics with its appropriate and specific language and logic) and the microscopic level NR2 (related to quantum physics with its own appropriate and different logic). Research at point T corresponds to research focused on a level of reality where what is mutually exclusive at level NR1 can be unified at this level NR2. It corresponds to the included middle for which point T is not at the same level that the contradictory logical antagonisms. Nevertheless, the antagonism is never completely solved at NR2. New antagonisms can appear from point T at level NR2. The figure is only a simple heuristic to represent

[7] Basarab Nicolescu, *Meaning and Evolution* (New York: Parabola Books, 1991).

the level structure of the included middle in quantum physics. In this representation, no basic contradictions with Aristotle's logic of non-contradiction occur because point T is not at the same level of the two components of the basic contradiction.

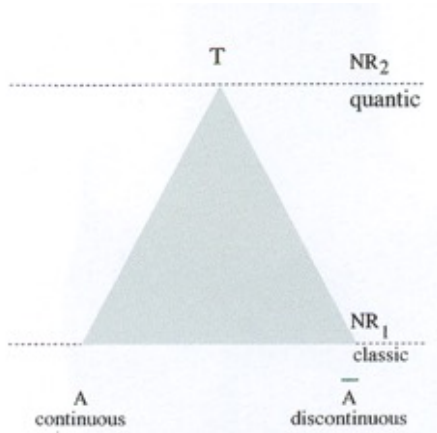

FIGURE 1. LEVELS OF REALITY IN THE LOGIC OF THE INCLUDED MIDDLE.
NR* 1 = macroscopic (level 1, local causality and separability, classical physics)
NR* 2 = microscopic (level 2, global causality and nonseparability, quantum mechanics)
NR = *niveau de réalité* (level of reality)

Something is beyond our knowledge, something of the order of Origin

Through the relation of the observer with reality in quantum physics, one can say that something resists our experiments and is beyond our understanding [8]. Contrary to classical physicists, the quantum physicists say: 'if you do such experiments you will observe such effects'. Physics is then only able to predict the observations but not to directly describe reality. A form of complexity including the observer leads to speaking of a 'veiled reality'[9]. It looks impossible to the quantum physicist to reach the foundations of things, the origin of things, as previously said by the philosopher Kant. This underlines an essential evolution of the ideas of reality and truth in hard sciences, and opens to the question of the withdrawal of foundations![10]

[8] Ian G. Barbour, *Religion and Science* (San Francisco: Harper, 1997).
[9] Bernadrd d'Espagnat, *Une incertaine réalité* (Paris: Gauthier-Villars, 1995).
[10] Jean Ladrière, 'L'Abîme' in *Savoir, faire, espérer; les limites de la raison*, vol.1, ed., Jean Beaufret, (Bruxelles Pub, Facultés Univ. St Louis, 1976).

Moreover, whether it be in the study of language (Wittgenstein), logic (Gödel), the structure of matter (Heisenberg), or irreversible evolution (Prigogine), it is apparent that similar conclusions are reached regarding to incompleteness, the horizon of undecidability/unpredictability and the impossibility of limiting truth to the totality of what can be said, whether this be formally demonstrated or directly measured.

To accept that something can be formalised, is to accept that some aspect of that 'thing' is necessarily missing. Thus, constructing a theory of knowledge requires acceptance that something is *beyond our knowledge*. This does not represent a defeat of scientific reason, but a condition of progress in intelligibility.

Physicists experiment with something that escapes! They face what we can call the mystery of knowledge, in the sense of the French philosopher Gabriel Marcel who makes the distinction between a problem and a mystery:

> The problem is a question that we ask ourselves about elements that have been laid out before us, as it were, and that are, generally speaking, external to us. There is mystery, on the contrary, when the one asking the question belongs to the very thing about which he is asking the question, that is, the mystery of being, about which I can only inquire into insofar as I am.[11]

The mystery of knowing can be a 'bridge', a mediation, between scientists and theologians and favours their dialogue, in respect to their two distinct domains. Thus, in the apophatic theology, the mystery of God the 'Unspeakable', is illustrated in the famous prayer attributed to Gregory of Nazianzus, 'O transcendent, Almighty God, what words can sing your praises?...'.

Far from being a 'knowledge gap', mystery is a call for exploration. The rehabilitation of mystery at a philosophical level (G. Marcel uses the term 'meta-problematical' to describe mystery) allows for an interesting bridge between science and theology, and a real opening to alterity, the origin of things and the research of God! The mystery of knowledge is related to very different fields for the scientist and the theologian,

[11] Gabriel Marcel, *Positions et approches concrètes du Mystère ontologique* (Nauwelaerts et Vrin, 1949), 35.

but both are facing a reality which is beyond their knowledge. Their acceptance of the mystery of knowledge is an opportunity for an openness to alterity, with the joyful incomplete condition which is not a defeat of human reason but a real opportunity to research the truth (which is always beyond our understanding).

The logic of the included middle in theology

In Christian theology, one can represent the mystery of Incarnation and the Biblical Covenant with the same methodological approach of the logic of the included middle (Figures 2 and 3), with respect to the specificity of the Christian mysteries. Figure 2 illustrates a representation of the dogma of Incarnation, using the levels of reality. In classical language, man is finite and God is infinite. In classical logic, an entity cannot be both finite and infinite! This statement defines reality level NR1 (bottom of triangle). In the Christian tradition, the unity of antagonisms between finite and infinite is realised by Jesus Christ, reality level NR2 (faith, top of triangle). Here, the incarnate Son of God, Christ, realises the unity of antagonisms, especially on the Cross. For the believer, the Cross is the sign of a 'passing-through;' a sign of conversion that is never finished! Thus the believer goes by faith from level NR1 to level NR2, but never totally reaches point T. The novelty of Christ is given by Revelation and is completely beyond what we can imagine, even if we can approach the mystery by human reason. This is typical of the apophatic approach.

Even if there is no relation between the status of quantum reality and the status of Jesus Christ (obviously!), the antagonism 'finite-infinite' in theology in comparison with the continuous-discontinuous antagonism in science, along with their corresponding modes of representation, is quite analogous in terms of the logic of the included middle. The analogy here is related to the mode of representation in terms of logic, not to the attributes! The logic of quantum physics appears quite interesting for presenting the terms of Christian dogmas.

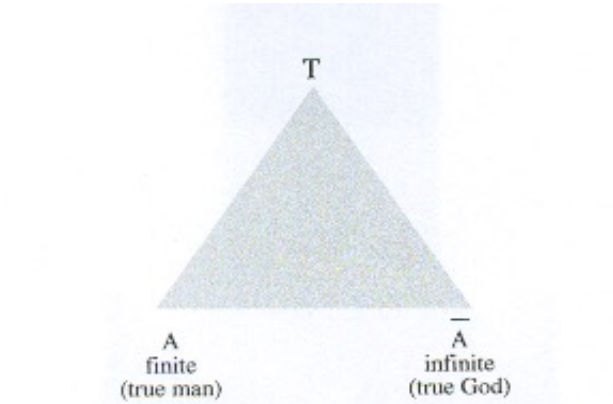

Figure 2. Representation of the dogma of Incarnation in terms of levels of reality in the logic of the included middle.

Another important point of the Christian tradition, the Covenant between God and man in the Bible, can also be expressed in terms of complementarity, using the logic of the included middle. Creation is separated from God (one of the translations of 'creation' in Hebrew means 'separation') and is, at the same time, in relation with God through the Covenant. Thus, the Covenant includes both the separation (alterity) and the relation (unity/communion), as shown in Figure 3.

There is a strong unity of antagonisms in the Covenant that allows both freedom of choice for man and the given gift of love from God to humanity. The love of God given to humanity is completely free, which opens a free man's response. The experience of faith is open to an understanding of the covenant as a unity of antagonisms that is never completely solved by man. Using the terms from the hylemorphism of Aristotle, one can say that the actualisation of the separation induces the potentialisation of the relation. Similarly, the actualisation of the relation induces the potentialisation of the separation, in a dynamic equilibrium.

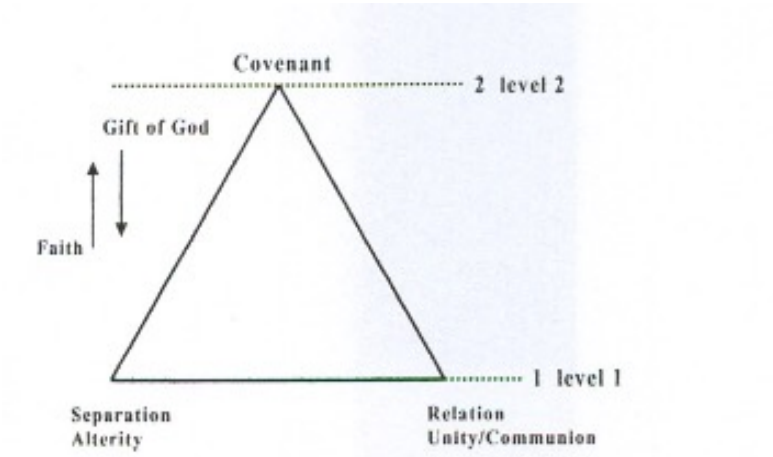

FIGURE 3. Representation of the biblical Covenant between man and God.

In this dynamical equilibrium through the presentation with the included middle logic, the fundamental alterity between God and Creation is clear, which avoids classical forms of pantheism. Thus, a true partnership is proposed by God to man in the Covenant. The free love of God allows and generates the freedom of man. Then, the sin of man will in fact correspond to the rupture of man from the couple alterity-unity, for instance when man takes the place of God or when he builds some idols. In contrast, man can become himself inside the alterity-unity offered by the free love of God. The more man becomes man, the more God appears both intimately linked with man and completely 'Other'! Moreover, looking to the Covenant through complementarity emphasises the fact that God creates at each moment and not only at the beginning of time and space. The love of God gives being and life to creatures at once. This way to present Creation in Christian theology is of prior importance in the debate between science and theology.

Finally, Jesus Christ opens the New Creation through the cross and Easter. On the cross, he realises the perfect antagonism 'separation-unity' with his Father, which opens to the New Covenant between God and Humanity, God and Cosmos. In daily life, this unity of antagonisms of 'full power of God-non power of Christ on the Cross' corresponds to the fundamental way for the Church towards God's Kingdom! Then for the Christ disciple, to become himself is closely related to giving himself to God.

Apophatic theology and Creation by relationships

The French Christian philosopher Blaise Pascal said 'The last function of reason is to recognise that there is an infinity of things which surpasses it'[12]. The apophatic tradition, since Denys the Areopagite, is well known in Orthodoxy. In the Catholic tradition, Nicholas de Cusa (1401-1464) is one of the most famous examples. He wrote *incogniscibilis Deus se mundo in speculo et aenigmate cogniscibiliter ostendit*—the unknowable God shows himself in a knowable way by the world, in the mirror or in enigma[13]. His most famous book is named *De docta Ignorantia*, which can be translated as the learning ignorance. 'All that we conceive that God is, it is no more true to affirm that it is, rather to deny it. All we conceive that God is not, it is no more true to deny that it is rather sweet to affirm.'[14]

To approach the mystery of God, reason works but recognises at the same time its ignorance in speaking of the Unspeakable. Nevertheless this ignorance can become *learning* when the human being, aware of the abyss of the 'unknowledge' where his reason leads him to face God's mystery, can let himself go to the mystery and 'welcome' the unspoken that gives itself to man. This approach doesn't reject reason. On the contrary, it gives to reason a significant role that goes to the recognition of its own limits (unknowledge)!

As an example, Nicholas de Cusa puts human reason in front of contradiction through the logical assertion of God as both 'maximum and minimum'. The corresponding *coïncidentia oppositorum* at infinite takes into account the fact that human reason can only reach 'possibles', but also that something in the human soul is capable of 'impossibles'! The human intellect is crossed by something which escapes the human being but which is constitutive of himself. The finite man is crossed by Infinity. In this situation, the 'intellect' in the *coïncidentia oppositorum* is able to enter the mystery of the infinite God.

Nicholas de Cusa speaks about God as the 'non-Other'.[15] (For him, we can only say about the non-other that he is non-other than the

[12] Blaise Pascal, Pensées, 267, ed. Leon Brunschvicg (Paris: Édition 1897).

[13] Nicolas de Cues, *Dialogue à trois sur le pouvoir-est: Trialogus de possest*, trans. P. Cayer et al. (Paris, Librairie philosophique J. Vrin, coll. « Philologie et Mercure », 2006), 107.

[14] Nicolas de Cues, 'La docte ignorance', trans. M. de Gandillac, in OEuvres choisies de N. de Cues, (Paris: Aubier, 1942) 71.

[15] Hervé Pasqua, Introduction, *Nicolas de Cues. Du non-autre, Le guide du penseur*, trans. Hervé Pasqua (Paris: Éditions du Cerf, Paris, 2002).

non-other. This definition is the threefold repetition of the name ('the non-other is non-other than the non-other'), and it doesn't only show that this 'essence' is determined by itself without the need of anyone else, but it reveals its trinity in an indivisible unity. The non-Other gives life to the Other in the exact movement he is leaving. Indeed, the God 'One and Three' is the foundation of the real Unity: 'Given that the absolute unity is necessarily three-one… the universe could not be one without the Trinity it is coming from'[16]. The reasoning of the 'non-other' is mainly set on the intellectual level, but one should not forget the mystic theologist who is sensible to the communion between those three persons, with a direct link between creation and salvation.

In this view, one can propose with Nicholas de Cusa the vision of the 'Unitrinity', vision of the creation by Christian trinity, creation by relationships, as represented on figure 4.

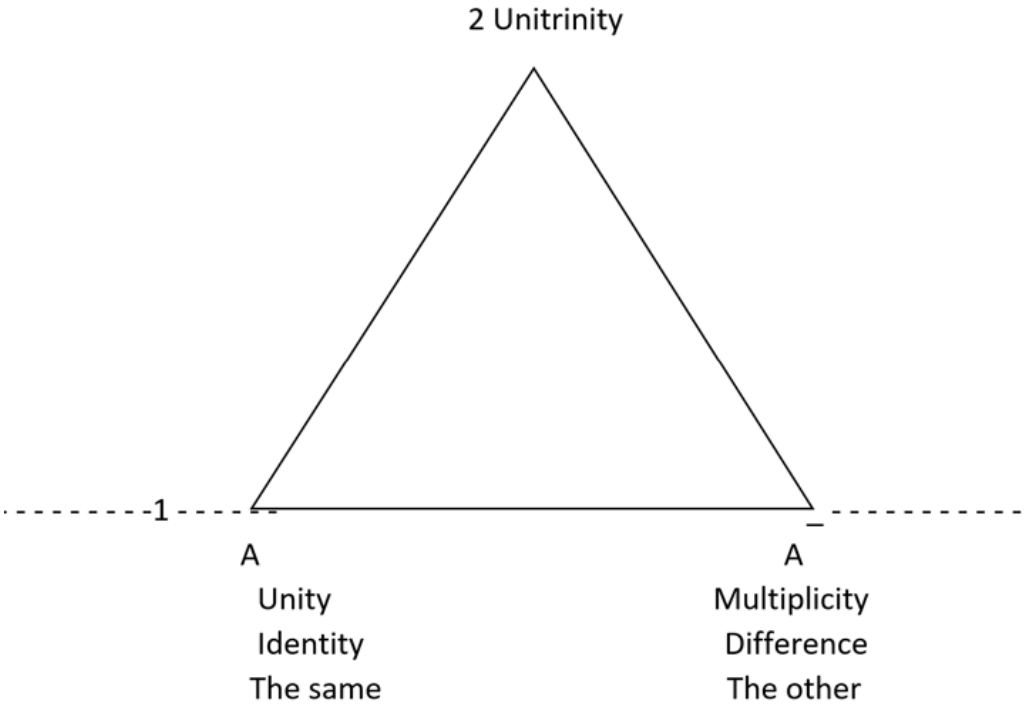

Figure 4. Representation of the trinity in terms of levels of reality. Level 1: the one who is; Level 2: the one who is non-other than the one.

[16] Nicolas of Cusa, *On learned ignorance (De docta Ignorantia)*, II, 7, (Minneapolis, Minnesota: Arthur J. Banning Press, 1981).

The creative fertility of God is due to the communion of the Three. Their union, which is absolute unity, is creating, creative and personalising through love-movement relationships to the creation, particularly to humanity. Animated and non-animated elements do enter in the circle of influence of the Unitrinity in his creative dynamics. They unite themselves by becoming what they are.

Such creation by relationships is explained by Nicholas de Cusa in the 'learning ignorance':[17] 'created things begin to be by virtue of the fact that God is Father; they are perfected by virtue of the fact that He is Son; they harmonize with the universal order of things by virtue of the fact that He is Holy Spirit.'

One will notice the three 'by virtue of', emphasise the fact that the origin of things is a gift from the One that is One and Three. In the dynamics of relationships between the three, love overflow gives the creation. God is present until the depths of the matter and he is creating by 'shaping resemblances', all of this by being transcendent. There is no pantheism in this presentation: even if there is a strong relation between God and the universe, the Creator stays distinct from the world and creates from 'innerself'. The universe becomes a kind of gateway to the knowledge of the creative Trinity: *All the created powers carry the image of the productive power from the creating Trinity*.'[18] (Here we can recall the following sentence: 'For in Him we receive life, movement and being' (Acts 17, 28).[19]

In conclusion, what we can say is that the philosophical category of the mystery (mystery of knowing) is quite a relevant mediation between physics and theology, particularly in the context of quantum physics. The logic of the included middle is then relevant to exploration of a reality which is always beyond our understanding, while reaching the human soul. The creation by relationships, the gift of the Trinity in its inner dynamics, looks quite interesting for the dialogue between science and apophatic theology.

[17] Ibid., I, 24.
[18] Nicolas of Cusa, *De pace fidei*, 8.
[19] All the created powers carry the image of the productive power from the creating Trinity.

Apophaticism in Orthodox Theology and the Apophaticization of Quantum Physics

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This article explores how Orthodox Theology (OT) and QM could benefit from each other in contributing to a fruitful interplay between theological and scientific cultures. One can refer to such interplay as a process of cultural translation which refers to the act of describing for members of one cultural community how members of another interpret the world and their experience within it. The specific focus is on the apophatic attitude to language and reality. While apophaticism has been a key characteristic of OT, it is a relatively new thing for QM. The article will specifically focus on discussing QBism – a most recent interpretation of QM – and use the discussion to illustrate how OT and QM could enrich each other by engaging in a fruitful dialogical interaction. It will also discuss a similar ongoing translation between quantum physics and the human sciences which is currently taking place with the emergence of a quantum social science.

Introduction

The title of this text refers to the role apophaticism plays in two very different contexts—Orthodox theology and quantum mechanics. Why apophaticism, why in these two specific contexts? Discussing apophaticism seems to be naturally related to theology and religion. Does it need to be? Not necessarily, since the topic has been discussed extensively, for example, in literature. In his recent book 'On the Universality of What Is Not—the Apophatic Turn in Critical Thinking' William Franke examines the application of apophatic thinking

across a variety of disciplines, including media and politics, as well as explores the role of theology in fostering a more universal apophatic consciousness. According to Franke:

> Integrating an 'apophatic' (literally 'negative,' but, in effect, eminently affirmative) detachment and awareness into our determinately, rigidly positive programs can make them open to others in ways that are critical to their success in generating consensus and the will to work together. The discretion of not saying (or knowing) is key to eliciting even just provisional acceptance from others rather than provoking resistance and retrenchment into oppositional camps and stances.[1]

Even though such view on apophaticism impresses with its inspiring inclusivism, it manifests the clear signs of a tendency towards relativism. As we shall see, the other natural temptation of apophaticism is agnosticism (this is one of the lessons we can learn from the history of Orthodox theology).

Despite the temptations, the excitement with apophaticism has become a common trend in the twenty-first century theological works. Van Kuiken speaks about the existence of an apophatic turn in modern Trinitarian theology.[2] Martin Liard suggests that there is an ongoing apophatic rage which made many theologians identify themselves as apophatic.[3] According to Laird, much of the retrieval of the Christian apophatic tradition has been inspired by a sustained dialogue with postmodern deconstruction philosophers such as Jacques Derrida.

The growing interest in apophaticism should not come as a surprise because the apophatic attitude to reality has a fundamental anthropological dimension. It is ultimately grounded in the incomprehensibility of human beings which, according to Jean-Luc

[1] William Franke, *On the Universality of What Is Not—The Apophatic Turn in Critical Thinking* (University of Notre Dame Press, 2020), 4. This reference appears as an example of interpreting apophaticism in rather relativistic terms. Other potential dangers are to interpret it agnostically or within predominantly discursive modes of inquiry.

[2] E. Jerome Van Kuiken, 'Ye Worship Ye Know Not What'? The Apophatic Turn and the Trinity, *International Journal of Systematic Theology* 19, no. 4 (October 2017): 401-420, doi:10.1111/ijst.12227.

[3] Martin Laird (2001). 'Whereof We Speak': Gregory of Nyssa, Jean-Luc Marion and the Current Apophatic Rage, *Heythrop Journal* 42, no.1: 112.

Marion, is 'founded and required by the incomprehensibility of the One whose image and likeness man bears.' In this sense it is bound up with theology. At the same time, continues Marion, 'it does not belong entirely, or even foremost, to theology, because man must comprehend this very incomprehensibility, by opposing it to, and preserving it in front of, every other comprehension that he gains over every other thing … In this sense, … man's incomprehensibility comes under the domain of philosophy' and 'can be seen to define the proper domain of … philosophy of religion.'[4]

According to Saul Bellow, the indispensability of the human concern for apophaticism could be also seen in broader human existential terms:

> The essence of our real condition, the complexity, the confusion, the pain of it, is shown to us in glimpses, in what Proust and Tolstoy thought of as 'true impressions.' This essence reveals and then conceals itself. When it goes away it leaves us again in doubt. But our connection remains with the depths from which the glimpses come. The sense of our real powers, powers we seem to derive from the universe itself, also comes and goes. We are reluctant to talk about this because there is nothing we can prove, because our language is inadequate, and because few people are willing to risk the embarrassment. They would have to say, 'There is a spirit,' and that is taboo. So almost everyone keeps quieter about it, although almost everyone is aware of it.[5]

The growing interdisciplinary interest in apophaticism still does not explain our interest in discussing apophaticism across two so different domains—Orthodox theology and quantum physics. The choice of a methodological approach that could enable such exploration is not trivial at all. We need therefore to start by discussing the methodological grounding of such interdisciplinary exploration.

[4] Jean-Luc Marion, Inaugural lecture as the John Nuveen Professor of the Philosophy of Religion and Theology at the University of Chicago School of Divinity. Jean-Luc Marion, Mihi magna quaestio factus sum: The Privilege of Unknowing. *The Journal of Religion* 85, no. 1 (January 2005): 1-24, p. 23-24.

[5] Saul Bellow, It All Adds Up (New York: Penguin, 1995), p. 96-97. Saul Bellow (born Solomon Bellows; 1915 - 2005) was a Canadian-born American writer. For his literary work, Bellow was awarded the Pulitzer Prize, the Nobel Prize for Literature, and the National Medal of Arts.

Talking about methodology — the ACTA approach

The Analogical Comparative Theological Approach (ACTA) is a constructive approach to the exploration of the encounter between theology and physics which incorporates two different methods grounded in analogical isomorphism and comparative theology.[6]

Analogical isomorphism[7] seeks to generate insights by uncovering parallels between two supposedly similar issues, concepts, or relations in two different domains of human experience by, *first*, examining how these issues, concepts, or relations emerge and operate within their own natural contextual environment and, *second*, using the examination as an exploratory lens focusing on uncovering the differences and similarities in the applications of the concepts and the unfolding of the relations.[8] I have found the application of the analogical isomorphism method highly valuable in exploring the parallels of the distinction between essence and energy in Orthodox theology and physics.[9] *Comparative theology*, on the other hand, is an emerging discipline within theology that explores the creative tension between the comparative and the theological aspects of interreligious endeavors.[10] It represents a special type of theological practice committed to deep interreligious learning

[6] The articulation of ACTA was inspired by both my theological research and teaching experience. The foundations of this approach were set in my *Energy in Orthodox Theology and Physics. From Controversy to Encounter* (Eugene, OR: Wipf & Stock, 2017) and then complemented by the development of a comparative theological perspective in a science and theology context: Stoyan Tanev, 'Exploring Analogy of Debates to Approach the Encounter between Orthodox Theology and Quantum Physics,' *Analogia-The Pemptousia Journal for Theological Studies*, 12 & 13 (2021): 97-135; Stoyan Tanev, 'The Encounter of Theology with Physics: An Eastern Christian Perspective', in *T&T Clark Handbook of Christian Theology and the Modern Sciences*, ed. John Slattery (London: T&T Clark, 2020), 209-222; S. Tanev, 'Using the Concept of Energy to Encounter Orthodox Theology with Physics: An Analogical Comparative Theological Approach (ACTA)', in *Orthodox Christianity and Modern Science: Tensions, Ambiguities, Potential. Science and Orthodox Christianity Series*, Vol. 1, eds. Gayle Woloschak & Vasilios Makrides, (Turnhout, Belgium: Brepols, 2019), 127-146; S. Tanev, 'Adopting an Analogical Comparative Theological Approach to the Encounter of Orthodox Theology with Physics', *Theoforum*, 49 (2018): 153-173.

[7] Stoyan Tanev, *Energy in Orthodox Theology and Physics. From Controversy to Encounter* (Eugene, OR: Wipf & Stock, 2017).

[8] Bernard Lonergan, 'Isomorphism of Thomist and Scientific Thought', in *Collected works of Bernard Lonergan — Collection*, Frederick Crowe and Robert Doran, eds. (Toronto, ON: University of Toronto Press, 1988), 133-141,133. See also Yann Schmitt, *L'Être de Dieu. Ontologie du théisme* (Paris: Ithaque, 2016).

[9] First in Stoyan Tanev, 'Essence and Energy— an Exploration in Orthodox Theology and Physics', *Logos - Journal of Eastern Christian Studies*, 50, 1-2 (2009) 89-153, and in some more detail in Tanev, *Energy in Orthodox Theology and Physics*.

[10] Francis Clooney, *Comparative Theology: Deep Learning Across Religious Borders* (Chichester, England: Wiley-Blackwell, 2010); Klaus Von Stosch, 'Comparative Theology as Challenge for the Theology of the 21st Century', *Religious Inquiries*, 1 (2012): 5-26; Paul Hedges, *Comparative Theology. A critical Methodological Perspective* (Leiden: Brill, 2017).

while staying rooted in a specific religious tradition.[11] In contrast to the theology of religions, comparative theology is a theology of learning that engages in an in-depth study of the particularities of other religious traditions. It is 'not primarily about which religion is the true one, but about learning across religious borders in a way that discloses the truth of my faith, in the light of their faith'.[12]

The generative principles of comparative theology[13]

First, comparative theology is characterised by its micro-logical approach and attention to the particular. It acknowledges that the adoption of specific language games affects the meaning and expression of religious convictions as well as the quality of the encounter between different religious traditions.[14]

Second, comparative theology is concerned with contemporary problems and addresses highly relevant questions. It focuses on theological problems and concerns related to lay questions about sense, ultimate purpose, salvation, and truth, in addition to issues raised by academics and specialists.

Third, comparative theologians deal with specific religious beliefs but, at the same time, attempt to incorporate their deeper understanding of the position of the other into their own theology. Ideally, comparative theologians should have studied more than one theology and should be able to switch back and forth between the two different confessional perspectives.[15]

Fourth, comparative theology needs the instance of a third position—an issue, a problem, or an open question that enters the two religious traditions as a challenge from the outside while, at the same time, offering an opportunity for the two traditions to engage dialogically in addressing the issue by using the potential of their internal resources. A third position must be concrete, highly relevant, and able to serve as a

[11] Clooney, *Comparative Theology*, 15.
[12] Ibid., 15-16.
[13] Von Stosch, 'Comparative Theology as Challenge', 5-26. The summary of the comparative theological principles presented here follows von Stosch's logic.
[14] Von Stosch, 'Comparative Theology as Challenge', 12.
[15] Ibid., 13.

continuous reference to the dialogue by playing the role of a controlling instance driving the logic of the comparison.

Fifth, comparative theology focuses on praxis followed by reflection—the praxis of different religious traditions and a reflection upon further developments within the interreligious dialogue.

Sixth, the adoption of dialogical open-mindedness should make comparative theologians aware of the vulnerability of their judgements within the context of their own tradition. Such vulnerability could emerge from the existence of competing theological interpretations exactly within one specific tradition. Comparative theology considers such competing interpretations as opportunities that could enable a constructive reflection on existing open questions or controversies.

The ACTA approach to the exploration of the encounter between theology and physics integrates the methodological intuitions of analogical isomorphism and comparative theology. In fact, the comparative theology method could be considered as an instrumental enhancement of analogical isomorphism. If properly applied, ACTA can be used as a way of exploring the relations between theology and any scientific discipline, not just physics.

It is however important to clarify two points with respect to the objective of the present text.

First, I am not trying to make or claim contributions to the two domains that I am going to explore comparatively. I am just trying to identify insights developed by other scholars for the sake of using them as part of the comparative approach. My focus is on adopting the comparative approach in a way that could help me reflect on the specifics of the encounter between Orthodox theology and physics.

Second, the ACTA approach should be considered as a 'soft' research method. It is a participatory research approach which aims at engaging both the author and the audience in the task of comparison for the sake of developing insights that are impossible to develop otherwise. In this sense, one of the most valuable outcomes of this text would be to inspire an interest in the readers to go deeper into the task of comparison and develop their own perspectives.

Apophaticism in Orthodox Theology

Theology has been traditionally perceived to operate in two discursive modes: positive and negative.[16] The former refers to positive (kataphatic) theology, the latter to negative or apophatic theology. Kataphatic theology operates with affirmative assertions: God is Good, Being, Wise, etc., while negative theology works with negations: God is incomprehensible, infinite, beyond knowledge, etc. Over the centuries, the Western Christian Church has been using the term negative theology while the Eastern counterpart has been mostly referring to apophatic theology. However, this is not just a linguistic difference. There is a difference between the negative theology of the Western Church and the apophatic theology of the Eastern Church. The term 'apophatic theology' in the East has acquired a meaning which does not refer to the ways of defining God either positively or negatively. To speak apophatically of God means to transcend all attributes of God, whether positive or negative; it means to accept the challenge of using narratives to share personal or community experiences of God with others, knowing that there are no words that are good enough to do that. In this sense, Eastern Christian apophaticism does not restrict itself to the discursive task of theology alone.[17]

According to Christos Yannaras, the term 'apophaticism' in the Eastern Church refers to 'our refusal to exhaust knowledge of the truth in its formulation. The formulation is necessary and required, because it defines the truth, it separates and distinguishes it from every distortion and falsification of it. … At the same time though, this formulation neither replaces nor exhausts the knowledge of the truth, which remains experiential and practical, a way of life and not a theoretical construction.'[18] Yannaras emphasises the need for theology to go beyond the distinction between positive and negative linguistic connotations and adopt an attitude to language similar to the one adopted by some of the modern sciences. According to him, one of the characteristics of post-modernity is the emergence of a new language in dealing

[16] Here I am following closely the logic of the text by Marios P. Begzos, 'Apophaticism in the Theology of the Eastern Church: The Modern Critical Function of a Traditional Theory,' *The Greek Orthodox Theological Review* 41, no. 4 (1996): 327-357.

[17] Marios Begzos, 'Apophaticism in the Theology of the Eastern Church: The Modern Critical Function of a Traditional Theory,' *The Greek Orthodox Theological Review* 41, no. 4 (1996): 327-357.

[18] Yannaras, *Postmodern Metaphysics*, 84.

with ontology and reality, a language emerging from two scientific disciplines—quantum mechanics and post-Freudian psychology.[19] According to him, the post-modern duty of the Church includes the appropriation of the new language aiming at linking the salvific message of the Gospel to linguistic categories that could be more efficient in the interpretation of 'the reality of existence, the appearance and disclosure of being,'[20] and more specifically, in the articulation of the experiential mode of the relationship between God, the world, and man.

How did the Eastern Church Fathers deal with issues related to theological language? According to Fr John Romanides, they stress that all the expressions and concepts that a human person can have, are products of human thought.[21] Concepts and expressions did not come down from heaven and God did not personally create concepts and expressions in the human mind. There is no divine language.[22] God does not communicate with man by using some special language that he gives to those with whom He communicates. Fr Georges Florovsky expressed a similar point in a beautiful way:

> The scriptures transmit and preserve for us the Divine Voice in the tongue of man. The scriptures transmit and preserve for us the Divine Word such as it had been heard, such as it sounded in the receptive soul of man. The mystery of Divine inspiration is not only that God spoke to man, but also that man was listening to God and heard him. God descends to man, shows his Face to man; speaks to him. And man sees God, is lost in the vision of God, and describes what he has seen and heard, bearing witness to what has been revealed to him. … It is already in the Old Testament that the Divine Word becomes human, is incarnated in the human tongue. And there is another point of great importance. If we want the Divine Word to ring clear,

[19] Янарас, Христос. 'Постмодерната актуалност на понятието личност.' *Кризата като Предизвикателство*. София: Лик, 2002.

[20] Yannaras, Elements of Faith, Ch. 6, 43.

[21] Here I am following closely the logic of the text of Fr John Romanides' Patristic Theology, p. 59-60.

[22] Compare this statement with a statement that Aage Petersen attributed to Niels Bohr: 'When asked ... [about] an underlying quantum world, Bohr would answer, 'There is no quantum world. There is only an abstract quantum physical description. It is wrong to think that the task of physics is to find out how nature is. Physics concerns what we can say about Nature.'' See: Aage Petersen, *Bulletin of the Atomic Scientists*, 19 (1963): 8-14, 12.

> the human tongue must not lose its natural qualities. It must not leave off being human. What is human is not suppressed or swept away by Divine inspiration; it is only transfigured. The supernatural does not go counter to what is natural. … The Word of God may be exactly and strictly expressed in the language of man, who is created in the image and likeness of God; in the image of God's Word, as was taught by some of the Fathers of the Church. The Word of God does not grow dim because it sounds and is pronounced in the tongue of man. On the contrary, the human word becomes transfigured, transubstantiated, because God deigned to speak in the human tongue. The Divine Spirit breathes in the organism of human speech, in the substance of human words. And therefore the tongue of man acquires force and firmness. It becomes possible for the word of man to speak of God. Theology becomes possible.[23]

At the same time, human language is the result of human needs and the human condition. This is the reason why, according to Fr John Romanides, we are free to borrow any name or concept and to attribute it to God as long as we do so in an apophatic way. God does not have any likeness in the created world.[24] There are no concepts in the created world that can be attributed to God as a way of describing him. So, according to Romanides, we can attribute a name to God, but only if, on the other hand, we also take it away from him. We can say that God is Light, but we can also say that God is darkness, and we do not add this additional qualification because God is not Light, but because God transcends light. So, for the Church Fathers, names are given and then they taken away or replaced by using opposites.[25] When they speak about God and attribute opposites to him, they go beyond or transform

[23] Fr Georges Florovsky, The Work of the Holy Spirit in Revelation. *The Christian East Journal* XIII, no. 2 (1932): 49-64. 1932: https://www.fatheralexander.org/booklets/english/holy_spirit_revelation_florovsky.htm.

[24] John Romanides, *Patristic Theology*, 59-60.

[25] It is interesting to compare this statement with a statement by Niels Bohr who is considered to be the father of quantum mechanics. According to Bohr there is an old saying of the two kinds of truth: 'To the one kind belongs statements so simple and clear that the opposite assertion obviously could not be defended. The other kind, the so-called 'deep truths', are statements in which the opposite also contains deep truth.' Niels Bohr, 'Discussion with Einstein on Epistemological Problems in Atomic Physics,' in P. A. Schilpp ed., *Albert Einstein: Philosopher--Scientist* (place, publication: publisher, 1949), 240.

Aristotle's law of contradiction (two opposite propositions cannot both be true in the same sense and at the same time). They do not follow the rules of classical logic when they deal with theological matters or talk about God. This is because the rules of logic are valid only for God's creation— the created world. What is logically valid in the created realm is not valid in the context of the uncreated reality of God; it needs to be theologically refined and corrected.

Dionysius the Areopagite has a very special place in the apophatic tradition of the Eastern Church. The corpus of the Areopagite is critically important because it stands at the crossroads between Christianity and Hellenism, as well as between the Western and the Eastern Church.[26] Maximus the Confessor in the seventh century and Gregory Palamas in the fourteenth century commented on it and defended it. The Areopagitic corpus almost achieved canonical status in the Eastern Church. The Western Church based its negative theology on Dionysius. Scotus Eriugena translated him into Latin and Thomas Aquinas commented on his book *On the Divine Names*. It is no mere historical accident that the Western Church accepted Dionysius and developed its negative theology based on his works. According to John Meyendorff, the Areopagitic corpus is 'the most read Greek writing of the Latin philosophers of the Middle Ages.'[27]

In the fourteenth century Barlaam the Calabrian attempted to base the unification of the Western and Eastern Churches on St Dionysius. Barlaam misunderstood Dionysius and turned apophaticism into nominalistic agnosticism.[28] St Gregory Palamas confronted Barlaam on several issues, two of which were his understanding of the nature of Divine knowledge and the ways of using logical propositions about God.[29] The confrontation created a theological controversy that resulted

[26] Begzos, 'Apophaticism in the Theology of the Eastern Church', 337.

[27] J. Meyendorff, *St Grégoire Palamas et la mystique orthodoxe* (Paris :Seuil, 1959), 42f.

[28] Marios P. Begzos, 'Apophaticism in the Theology of the Eastern Church: The Modern Critical Function of a Traditional Theory,' *The Greek Orthodox Theological Review* 41, no. 4, (1996): 327-357.

[29] John Romanides. 'Notes on the Palamite Controversy and Related Topics', Part I, *The Greek Orthodox Theological Review* 6 (1960-61): 193-202; Stavros Yangazoglou, 'Philosophy and Theology: The Demonstrative Method in the Theology of Saint Gregory Palamas', *The Greek Orthodox Theological Review* 41.1 (1996): 1-18; Иван Христов, 'Битие и съществуване в дискусията за метода между св. Григорий Палама и Варлаам,' in *Хуманизъм, култура, религия* (София: Лик, 1996), 37- 48; Robert Sinkewicz, 'The Doctrine of Knowledge of God in the Early Writings of Barlaam the Calabrian,' *Medieval Studies* 44 (1982): 181 - 242; Георги Каприев, *Византийска философия*, второ издание (София: Изток-Запад, 2011) (earlier

in some of the most insightful reflections on apophaticism in Eastern Christian theology.

Barlaam rejected the possibility of using apodictic proofs in theology and believed instead in the suitability of the dialectical method 'because it begins with, and has as its premises in, the universal laws and the data of created reality, which are subsequently applied to God. In this way, Barlaam sought the eternal and uncreated within the temporal and the created.'[30] He ignored the patristic distinction between created and uncreated, as well as the possibility for a direct revelatory presence and activity of God in the world. For him 'no vision or direct experience of God is possible without created intermediaries. Any gift of God, even the light of Tabor, inasmuch as it was perceived by the physical senses, constitutes a 'created spirit' or a 'created symbolic representation.' Based on such created representations, the soul rises through philosophy toward the immaterial archetypes which constitute perfection and the fullness of *theognosia*.'[31] Thus, Barlaam denied the empirical basis of *theognosia*.

According to Palamas, God is to be spoken of apophatically not because of the unknowability of his essence but because of the subtlety of the ways of knowing him through the Divine energies. Thus, if the difference between Divine essence and Divine energies is disregarded, theology becomes agnostic. St. Gregory accused Barlaam for claiming that 'there is nothing above knowledge'[32] and that it was only 'spoken knowledge' that could be called light.[33] According to St. Gregory there are two philosophies, a philosophy in words and another one in deeds, and there are 'many and various differences' between them.[34] He sees

edition in German: Georgi Kapriev, *Philosophie in Byzanz* (Wuerzburg: Koenigshausen und Neumann, 2005) 344); Иван Христов, *Византийското богословие през XIV век. Дискурсът за божествените енергии* (София: Изток-Запад, 2016); Norman Russell, *Gregory Palamas and the Making of Palamism in the Modern Age* (Oxford, UK: Oxford University Press, 2019); David Bradshaw, 'Natural Theology in St. Gregory Palamas', in David Bradshaw and Richard Swinburne, eds., *Natural Theology in the Eastern Orthodox Tradition* (St Paul, Minesota: IOTA publications, 2021), 51-64. The latest contribution to this topic can be found in Tikhon Pino, *Essence and Energies: Being and Naming God in St Gregory Palamas* (London: Routledge Research in Byzantine Studies, 2023).

[30] Stavros Yangazoglou, 'Philosophy and Theology: The Demonstrative Method in the Theology of Saint Gregory Palamas', *The Greek Orthodox Theological Review* 41 no. 1(1996): 1- 18; 16 - 17.

[31] Ibid, 17.

[32] Gregory Palamas, *The Triads*, II.3.11.

[33] Ibid., II.3.71.

[34] Ibid., II.1.21.

Barlaam's philosophy as being strictly discursive, bounded by language, and ultimately incapable of true knowledge of the Divine realm. The problem of such philosophy is its restriction of the mind to discursive reasoning alone, which makes the cognitive aspects of contemplation merely impossible. Whenever Barlaam speaks of contemplation, he reduces it to knowledge of created beings. Hence, the monks on Mount Athos did not think that it fits to call him a contemplative.[35] Barlaam's focus on discursive knowledge alone 'evidences a denial that one can go beyond words to the reality they indicate. That is, we can speak about God but, since he is transcendent, cannot encounter God himself.'[36] And 'it is not the same to say something about God as it is to possess and see God. For apophatic theology is a word, whereas contemplation surpasses words.'[37] 'The intellect, theologizing apophatically, thinks those things that are different from God, and thus acts by discursive reasoning. But in the other case there is union. … Contemplation is not simply abstraction and negation, but union and deification.'[38]

For Gregory Palamas the light seen by the Hesychasts is a pledge of union with God and a true encounter with him. For Barlaam the contemplation of light is restricted to the realm of concepts and to discursive thought where the words refer to natural phenomena.[39] 'The philosopher teaches that the knowledge we have from creatures is the most perfect vision of God'[40] but the knowledge of natural phenomena cannot be the measure of human progress towards the likeness of God. 'Such knowledge is trapped by a superficial consideration of phenomena—paralleling the superficiality of words—since 'every being that knows is established and remains in that which it knows."[41] We are therefore suspended in our language and need to deal with the consequences of this challenge.[42]

According to Palamas, *Theognosia*

[35] Pentecost, *Quest of the Divine Presence*, 61.
[36] Ibid., 62.
[37] Gregory Palamas, *The Triads*, I.3.17.
[38] Ibid., II.3.15.
[39] Pentecost, *Quest of the Divine Presence*, 63.
[40] Gregory Palamas, *The Triads*, II.3.67.
[41] Pentecost, *Quest of the Divine Presence*, 69, referring to *The Triads*, II.3.76.
[42] Compare again to a statement by Niels Bohr: 'What is it that we human beings ultimately depend on? We depend on our words. We are suspended in language. Our task is to communicate experience and ideas to others.' Quoted by Aage Petersen in 'The Philosophy of Niels Bohr,' in *Bulletin of the Atomic Scientists* XIX: 7 (1963): 8-14, 10.

> … is an event, a direct charismatic experience given to those who are pure of heart and mind, who are illuminated in body and soul by the uncreated light of divine grace. The prophets, the apostles and the saints of the Church ascended and ascend to this height of vision and communion with God. Together with this charismatic theology, which is basically a theophany of God, rationalistic theology has its place. The latter begins from and elaborates upon the insights of the former.[43]

The discussion of the legitimacy of using apodictic syllogisms in theology turned into a discussion of the nature—created or uncreated—of the theophanies in the Old and the New Testaments, as well as of the physical or sensible nature of the divine light seen by the Apostles during the Transfiguration of the Lord on Mount Thabor.[44] Fr John Romanides explicitly pointed out the Latin (or rather Augustinian) theological point of departure of the Calabrian monk.[45] For Barlaam, if the light shining at Mount Tabor was visible to the Apostles, it had to be created, definable and physically perceptible, i.e. it could not have been uncreated. For Palamas this light was uncreated, eternal and undefinable, transcending both the intellect and the natural laws of physical sensation. For him this is the Divine glory which is not an objectively given reality that can be perceived by anyone present, because its vision requires the transformative effect of the Divine energies. A close reading of the first homily of St Gregory Palamas on the Transfiguration of Christ will help in clarifying this point:

> The light of the Lord's transfiguration does not come into being or cease to be, nor is it circumscribed or perceptible to the senses, even though for a short time on the narrow mountain top it was seen by human eyes. Rather, at that moment the initiated disciples

[43] Stavros Yangazoglou, 'Philosophy and Theology: The Demonstrative Method in the Theology of Saint Gregory Palamas', *The Greek Orthodox Theological Review* 41.1 (1996): 1-18, 17.

[44] Stoyan Tanev, 'Created and Uncreated Light in Augustine and Gregory Palamas: The Problem of Legitimacy in Attempts for Theological Reconciliation,' *Analogia - The Pemptousia Journal for Theological Studies* 4(3), Special issue on St Gregory Palamas, Part 2 (2018): 81-114. On the transformative effect of the Old and New Testament theophanies see Bogdan Bucur, *Scripture Re-envisioned: Christophanic Exegesis and the Making of a Christian Bible* (Leiden; Boston: Brill, 2019).

[45] John Romanides, 'Notes on the Palamite Controversy and Related Topics', Part I, *The Greek Orthodox Theological Review* 6 (1960/1961):193 - 202, 194.

> of the Lord 'passed', as we have been taught, 'from flesh to spirit' by the transformation of their senses, which the Spirit wrought in them, and so they saw that ineffable light, when and as much as the Holy Spirit's power granted them to do so. Those who are not aware of this light and who now blaspheme against it think that the chosen apostles saw the Light of the Lord's Transfiguration with their created faculty of sight, and in this way they endeavour to bring down to the level of a created object not just that light — God's power and kingdom — but even the power of the Holy Spirit, by which divine things are revealed to the worthy.[46]

In this passage, St Gregory referred to St Maximus the Confessor in order to emphasise that it was actually Christ's disciples who were transfigured by the Spirit and made able to 'pass from flesh to spirit' so that they could see his divine glory.[47] A necessary condition for the theophanic experience is that the visionary is in the right state of soul under the influence of grace.[48] The divine light is not accessible to the human capacities in the way they naturally operate. It is physically invisible and inaccessible to them. Every human being can prepare by good works, purification of the heart and prayer, but the vision of the Divine light is ultimately given by the transformation of the natural human capacities through the enabling power of the gifts of the Holy Spirit, the Eternal Spirit of the Father and the of the Son, who proceeds from the Father and rests on the Son. In this sense, the spiritual empowerment which is enabled by the Holy Spirit is both Christological and Trinitarian.

The discussion of the relationship between apophatic theology and the experience of God is equally relevant today. In a recent discussion

[46] St Gregory Palamas, 'Homily Thirty-Four on the Holy Transfiguration of our Lord and God and Saviour Jesus Christ', in *The Homilies*, trans. Christopher Veniamin (Dalton, PA: Mount Tabor Publishing, 2009), 266 - 74, 269.

[47] Andrew Louth, *Maximus the confessor* (London: Routledge, 1996), 106, *Difficulty* 10, 1125D— 1128A: 'They beheld Him transfigured, unapproachable because of the light of his face, were amazed at the brightness of his clothes and in the honor shown Him by Moses and Elijah who were with Him on either side, they recognized his great awesomeness. And they passed over from flesh to spirit, before they had put aside this fleshly life, by the change in their powers of sense that the Spirit worked in them, lifting the veils of the passions from the intellectual activity that was in them'.

[48] Cory Hayes, *Deus In Se Et Deus Pro Nobis*: The Transfiguration in the Theology of Gregory Palamas and its Importance for Catholic Theology (PhD diss.: Duquesne University, 2015), 94.

of the theological contributions of Christos Yannaras, Federico Aguirre points out that

> [i]n the context of Orthodoxy, apophaticism does not define — not even by negation— a field of knowledge —'divine' reality— but it highlights a principally methodological issue, which defines a 'way' of accessing knowledge in general: the absolute priority of experience regarding its formulation. As Lossky points out, apophaticism is 'an existential attitude which involves the whole man: there is no theology apart from experience'.[49]

In a more recent study focusing on the theology and life of St Symeon the New Theologian, Fr Nikolaos Loudovikos provides an insightful reflection of the participatory nature of Eastern Christian apophaticism which can be used as a final point for this section:

> The grace of Baptism was scorned, since study of the texts alone was considered 'precise and certain information concerning the Holy Trinity.' Worship of the text stifled its spirit, and contemplation became speculative representation, or, according to Symeon 'foolishness.' Foolishness, then, is a preference for representation: when scholars hear about the triune radiance of the one divinity, they immediately conjure up in their minds a 'simile' of three suns and 'foolishly consider to perceive divinity —and thus the holy, consubstantial and undivided Trinity— as being the same as the simile.' But representation excludes 'union in knowledge' as a false and deceptive concept, whereas, in fact, it is 'knowledge through will,' that is, free, existential communion. … This union, then, happens through the will, without being representative; the communion obviates the need for representation, establishing apophaticism as experience of the Being: 'But if, indeed, they were united to Him, they would never dare speak about Him, seeing that everything in Him is inexpressible and incomprehensible;

[49] Federico Aguirre, 'Theological Apophaticism and Philosophical Nihilism, Towards a Theory of Knowledge', *Teología y Vida* 60 no. 2 (2019): 229-242, p. 231, referring to V. Lossky, *The Mystical Theology of the Eastern Church* (St. Vladimir's Seminary Press: Crestwood, NY, 1976), 39.

> and not only the mysteries about Himself but also the great part of His works are unknown to all.'[50]

> It is union, therefore, as communion in existence, which gives rise to apophaticism. It is not the apophatic as a comment on representation, but as an opportunity for participation. … This nonrepresentational, apophatic knowledge, being the result of participation, redefines the content of faith. Because otherwise faith risks ending up as a radical unfamiliarity with Being.[51]

Apophaticism in quantum mechanics

The current situation of quantum mechanics as part of physics could be described with a testimony by David Mermin — a physicist who has made genuine contributions to the foundations of quantum mechanics, quantum information science, and physics in general.

> More than ninety years after the invention of quantum mechanics, we find ourselves in a strange situation. Quantum mechanics works. Indeed, no theory of physics has ever had such spectacular success. From ignorance about the structure of matter, quantum mechanics has brought us, in less than a century, to an understanding so broad, powerful, and precise that virtually all contemporary technology relies on it. And the theory has enabled us to make sense of phenomena far beyond anything technology has yet been able to exploit. Yet despite this unprecedented success there is notorious disagreement about … . The sentence fades away because it is not so easy to say what the disagreement actually is about.

> What we lack is any consensus about what one is actually talking about as one uses quantum mechanics. There is an unprecedented gap between the abstract terms in which the theory is couched and the phenomena the theory enables us so well to account for. We do not understand the meaning of this strange conceptual

[50] Ibid., referring to Symeon the New Theologian, *Hymns* 3.261.
[51] Ibid., 92.

> apparatus that each of us uses so effectively to deal with our world. … What the hell are we talking about when we use quantum mechanics? For practical purposes ordinary everyday quantum mechanics is just fine, and what I have to say is of little or no interest. It is my hope to interest those who, like me, are impractical enough always to have been bothered, at least a bit, by not knowing what they are talking about.[52]

Many physicists and non-physicists consider quantum mechanics strange and weird. Here are some of the most common reasons for calling quantum mechanics weird:[53]

quantum objects can be both waves and particles

- quantum objects can be in more than one state at once
- it is impossible to know exactly and simultaneously two different properties of a quantum object (Heisenberg's uncertainty principle)
- quantum objects can affect one another instantly over huge distances ('spooky action at a distance' or quantum entanglement)
- it is impossible to measure anything without disturbing it, so the human observer cannot be excluded from the theory.

But, as Phillip Ball rightly points out, 'quantum mechanics says none of these things. In fact, quantum mechanics doesn't say *anything* about 'how things are'. It tells us what to expect when we conduct particular experiments. All of the claims above are nothing but interpretations laid on top of the theory.'[54]

The radicalness of quantum mechanics could be described as follows.

> In most physics equations, the variables refer to objective properties of the system they are describing: the mass or velocity of bodies in Newton's laws of motion, for instance. But according to quantum mechanics, the wave function is not like this. It's

[52] N David Mermin, 'Making better sense of quantum mechanics', *Reports on Progress in Physics*, 82 (2019): 012002 (16pp): https://doi.org/10.1088/1361-6633/aae2c6, 1-2.

[53] Philip Ball (2018). *Beyond Weird. Why everything you thought you knew about quantum physics is different*. University of Chicago Press, p. 11. I am grateful to Phillip Ball for the insightful articulation of the peculiarities of quantum mechanics provided in his book. I have greatly benefited from his narratives.

[54] Ibid.

> not obvious whether it says anything about the quantum entity itself—such as where it is at any moment in time. Rather, it tells us what we might see if we choose to look. It points in the wrong direction: not down toward the system being studied, but up toward the observer's experience of it. 'What makes quantum theory puzzling is … the fact that we cannot interpret the measurements as revealing some pre-existing properties of the system.' What's more, the mathematical machinery provides only probabilities that can be written down only if you stipulate how you're looking. If you do different measurements, you might calculate different probabilities, even though you seem to be examining the same system in both cases.[55]

According to Ball, it is possible that we might never be able to say what quantum theory really means. More specifically, we might find our words and concepts, our usual patterns of cognition, to be unsuited to articulating a meaningful interpretation. David Mermin expressed a similar opinion in a description of the way many quantum physicists feel about Niels Bohr,[56] the one who acquired the reputation of a highest authority with an almost quasi-mystical understanding that leaves even today's physicists wondering over his words.

> 'I have been getting sporadic flashes of feeling that I may actually be starting to understand what Bohr was talking about. Sometimes the sensation persists for many minutes. It's a little like a religious experience and what really worries me is that if I am on the right track, then one of these days, perhaps quite soon, the whole business will suddenly become obvious to me, and from then on I will know that Bohr was right but be unable to explain why to anybody else.'

[55] Philip Ball, 'Mysterious Quantum Rule Reconstructed From Scratch', *The Quanta Magazine*, February 13, 2019: https://www.quantamagazine.org/the-born-rule-has-been-derived-from-simple-physical-principles-20190213/

[56] The continuous references to Niels Bohr in discussions of the interpretations of quantum mechanics are not by accident. It is worth mentioning a 1929 comment by Paul Ehrenfest to a young physicist which convincingly attests to the status of Niels Bohr in the physics community: 'Now you are going to get to know Niels Bohr and that is the most important thing to happen in the life of a young physicist' (Casimir, H. B. G. 1968. Recollection from the Years 1929 -1931. In *Niels Bohr: His Life and Work as Seen by His Friends and Colleagues*, edited by Stefan Rozental (Amsterdam: North-Holland, and New York: Wiley, 1967), 109 – 13; 109.

What are the key differences between quantum mechanics and classical physics? Here is how Phillip Ball summarises Leonard Susskind's explanation of what is fundamentally different between quantum and classical mechanics:

- Quantum physics has 'different abstractions' — how objects are represented mathematically, and how those representations are logically related.
- Quantum physics has a different relationship between the state of a system and the result of a measurement on that system.[57]

The first of these statements seems to be intuitively understandable. The second however refers to the fundamental reason for quantum theory's counter-intuitive nature. How does the relationship between the state of a system and a measurement of the system come into play? Objects in classical physics have preexisting properties and a measurement tells us about the state of an object which is characterised by its measured properties.

> So we have no problem saying that the tennis ball was travelling at 100 mph and then we measured it. … We would never think of saying that it was travelling at 100 mph because we measured it. That wouldn't make any sense. In quantum theory, we do have to make statements like that. And then we can't help asking what it means. That's when the arguments start. … The fact that Susskind's second principle — the relationships between states and measurements — can be put into words, without any need for equations or fancy jargon, should reassure us. It's not easy to understand what the words mean, but they reflect the fact that the most fundamental message of quantum theory isn't a purely mathematical one.

The principle of complementarity and the breakdown of classical logic

It was around 1920 when light 'acquired' in physics an explicitly dual, i.e. wave-particle, character that was unexplainable by the existing laws

[57] Leonard Susskind & Art Friedman. *Quantum Mechanics: The Theoretical Minimum* (New York: Basic Books, 2014), 2.

of classical physics. Almost at the same time the universal nature of this duality at the quantum level became apparent as well. Both light and particles, under different complementary circumstances, can manifest their presence in a wave-like or particle-like manner, hence the concept of wave-particle duality. The need to conceptualise this duality required a new logical framework. A new logical framework was suggested by Niels Bohr in an effort to explain the wave-particle dualism in quantum physics.[58] The mutual exclusivity of the wave and particle behaviors of single quantum entities was the basis for him to define the principle of complementarity—a single quantum entity can either behave as a particle or as wave, but never simultaneously as both. The wave and particle behaviors of a single quantum entity cannot manifest themselves at the same time, but you need both to describe what a quantum entity is.

One of the basic laws of Aristotelian logic is the law of the excluded middle, which claims that x is either y or not y, or that an attribute belongs or does not belong to an object and there is no middle ground on which two essentially opposite attributes could belong to the same object. Traditional normative logic, which is premised on this law, is based on our dealings with macro-level phenomena and does not hold in the quantum domain where the dual quantum nature of physical reality requires a new logic and new epistemology.[59] The need for a new logical framework was based on the fact that, in addition to the need to represent two different sets of properties that preclude one another in any given experimental situation, both these sets were necessary to achieve a comprehensive understanding of the quantum object.

In what way exactly does the principle of complementarity contradict classical logic? The contradiction does not consist in the fact that two profoundly different models of behavior (wave vs particle) that preclude one another in any given situation are both necessary to achieve a complete understanding of a quantum object. The principle of complementarity ensures that we can never apply both models

[58] Niels Bohr, 'The Quantum Postulate and the Recent Development of Atomic Theory', *Nature* 121 (1928): 580-90. See also Steen Brock, 'Old Wine Enriched in New Bottles: Kantian Flavors in Bohr's Viewpoint of Complementarity', in *Constituting Objectivity, Transcendental Perspectives on Modern Physics*, eds. Michel Bitbol, Pierre Kerszberg, Jean Petitot (Berlin: Springer Science + Business Media B.V., 2009) 301- 316, 314.

[59] George Birkhoff and John von Neumann, 'The Logics of Quantum Mechanics', *Annals of Mathematics* 37 (1936): 823 - 43.

to the same entity at the same time (i.e., to the same experimental configuration or measurement). It is only when we tried to apply both models simultaneously to one and the same entity that contradiction would appear. For Bohr, however,

> [t]he aim of the idea of complementarity was to allow of keeping the usual logical forms while procuring the extension necessary for including the new situation relative to the problems of observation in atomic physics.[60]

Interestingly, Bohr refers to *a new situation*. What was this new situation? Before the emergence of quantum physics, all physical objects were known to behave in experiments consistently in one of two ways—as a particle or as a wave. As a result, some of the physical objects existing in nature were considered to possess the properties of a particle and others to possess the properties of a wave. There was no way for a classical object to deviate from its wave or particle properties in different experimental setups. After the emergence of quantum physics, scientific experiments clearly showed that an individual physical object can manifest properties of either particles or waves depending on the specific experimental configuration they are put into. In other words, it 'became possible' for physical objects to drastically alter their manifested properties depending on the specific personal engagement of the observer which included the design of a specific experimental configuration. In other words, one could not speak anymore of objectively existing properties of quantum objects independently of an observer's experimental intervention. The quantum object exists objectively, but its properties emerge within the context of the experimental setup and observer's intention behind it. This is what Leonard Susskind means when he points out that quantum physics has a different relationship (in comparison to classical physics) between the state of a system and the result of a measurement on that system. This is what makes quantum physics experiments to a great extent personal and 'subjective'. The world 'makes itself known to each of us through our own private internal perceptions.'[61]

[60] Ibid., 115-16.
[61] N. David Mermin, 'Physics: QBism puts the scientist back into science'. *Nature* 507

Albert Einstein vs Niels Bohr

A famous debate between Bohr and Einstein began at the fifth Solvay Congress in 1927 and continued until Einstein's death in 1955. The essential point of the disagreement in the debate was the answer to the question whether quantum theory was a complete theory. Einstein's position can be expressed by one of his most famous quotes today: 'Quantum mechanics is certainly imposing. But an inner voice tells me that it is not yet the real thing. The theory says a lot, but does not really bring us any closer to the secret of the 'Old one.' I, at any rate, am convinced that He does not throw dice'.[62]

According to Einstein, if our current understanding about the nature of quantum objects is probabilistic, this only shows that we are missing something and there should be some 'hidden variables' that escape our knowledge but will be certainly discovered as our theories keep improving over time. In other words, our ignorance about the variation of these hidden variables makes quantum reality appear as probabilistic, unpredictable, and unknowable in classical terms. Therefore, future knowledge of these hidden variables would supposedly make the description of quantum systems completely deterministic. In other words, although quantum indeterminacy may be a property of a quantum system in practice, it does not need to be so in principle. In this sense, the physical attributes of quantum systems can be viewed as objective or real even in the absence of measurement, and we could assume, as Einstein did, that there is a one-to-one correspondence between every element of a physical theory and the physical reality it is representing.

Bohr agreed that the existing theories may and will improve over time but believed that this improvement will still need the principles of uncertainty and complementarity because they are inherent characteristics of the nature of quantum objects. He looked at quantum objects in terms of their energetic manifestations in the effects of their

(2014): 421-23: https://www.nature.com/news/physics-qbism-puts-the-scientist-back-into-science-1.14912.

[62] Letter to Max Born (December 4, 1926), in Max Born and Albert Einstein, *The Born-Einstein Letters*, trans. Irene Born (New York: Walker and Company, 1971). Einstein used slightly different versions of this quote at other times. For example, in a 1943 conversation with William Hermanns recorded in William Hermanns, *Einstein and the Poet— In search of the Cosmic Man* (Wellesley, MA: Branden Books, 1st edition, 2011), 58, where Einstein was quoted to have said: 'As I have said so many times, God doesn't play dice with the world'.

interaction with measuring instruments rather than in terms of the properties they manifest in isolation and independently of an observer. In Bohr's ultimate view all available quantum phenomena are defined strictly in terms of the manifestations of particular aspects of their inner nature in recorded effects, such as the click of a photo-detector, rather than in terms of properties that are pre-assigned to the quantum objects independently of their involvement in an experiment.

The assignment of such properties to particles in advance, when they are on their own and outside of a specific experimental configuration, is unacceptable in view of the impossibility of any sharp separation between the individual behavior of atomic objects and their interaction with the measuring instruments that serve to define the conditions under which the observable phenomena appear. In this sense, quantum discreteness, discontinuity, individuality, and indivisibility are transferred to the level of the phenomena and their effects are manifested in a context of an experimental configuration which is preliminarily designed by the researchers. This transfer requires a terminological adjustment. All terms now apply to certain physically complex and apparently non-localised entities, each involving the whole experimental arrangement, rather than to single physical entities that are narrowly localised in space. In Bohr's view, there is no God-like perspective from which we can know physical reality in itself, i.e. when they are on their own and could be considered outside of the context of a physical experiment. Thus, we are forced to recognise that our knowledge of physical reality is in principle local and, therefore, incomplete.

Niels Bohr's way of expression, especially in the early stage of the development of quantum mechanics, did not help much in providing enough clarity to his positions. Even his own followers shared an uneasiness with respect to his way of using words and sometimes expressed wide disagreements with respect to what he really meant to say. For example, in a letter Paul Ehrenfest wrote to him dated July 17, 1921: 'Now, dear Bohr, every person I know wails only over the fact that you write your things so briefly and compactly that one always has the greatest trouble fetching all of the ideas out of the fruit cake'.[63] The point

[63] Catherine Chevalley, 'Niels Bohr's Words and the Atlantis of Kantianism', in *Niels Bohr and Contemporary Philosophy*, eds. Jan Faye and Henry Folse, 33 - 55 (Dordrecht: Kluwer Academic, 1994), 33.

here is that Bohr appeared to struggle with finding the proper language to express his view of the emerging quantum theory.

One could, however, look at Bohr's struggle in another way. 'He usually refrained from absolute statements about what he called 'deep truths', and although he joked about it, he actually believed that as far as they were concerned 'truth' and 'clarity' were complementary to each other.'[64] Heisenberg noted several times that Bohr did not have a problem with language but was in the process of creating a new one. In this process, he 'tried to keep the words and the pictures without keeping the meaning of the words and of the pictures, having been from his youth interested in the limitation of our way of expression, the limitation of words, the problem of talking about things when one knows that the words do not really get hold of the things'.[65] Heisenberg's view suggests that quantum physics needs to deal with the challenges of apophatisation in a way that is similar to the one discussed in the context of Orthodox theology.

Here is another interesting quotation from David Mermin:

> In my youth I had little sympathy for Niels Bohr's philosophical pronouncements. In a review of Bohr's philosophical writings I said that 'one wants to shake the author vigorously and demand that he explain himself further or at least try harder to paraphrase some of his earlier formulations.' But in my declining years, I've come to realize that buried in those ponderous documents are some real gems: 'In our description of nature the purpose is not to disclose the real essence of the phenomena but only to track down, so far as it is possible, relations between the manifold aspects of our experience,' and 'Physics is to be regarded not so much as the study of something a priori given, but rather as the development of methods for ordering and surveying human experience.'

[64] David Favrholdt, Niels Bohr's views concerning language. *Semiotica*, 94-1/2 (1993), 5-34, 5.

[65] Ibid. Heisenberg's comment deserves a deeper and more extensive study since it opens the opportunity for the discussion of a constructive analogy between the ways language was shaped in the early period of the discovery of quantum mechanics and during the time of the Ecumenical Councils of the Christian Church. 'The problem of talking about things when one knows that the words do not really get hold of the things' could be identified as equally present in both contexts.

A more balanced approach to the interpretation of the Einstein vs Bohr debate

According to a recent interpretation of the debate between Einstein and Bohr suggested by N. P. Landsman,[66] the discussions between Einstein and Bohr on the incompleteness of quantum mechanics 'were incredibly fruitful and informative for later developments in the foundations of quantum mechanics' and Bohr's refutations of Einstein's arguments were extremely thoughtful and elegant'.[67] According to Abraham Pais, a scientist who knew both Einstein and Bohr very well, Bohr is 'not only a major figure in physics but also one of the most important twentieth-century philosophers. As such he must be considered the successor to Kant'.[68]

Bohr's focus on the importance of classical physics concepts in describing quantum mechanical phenomena is particularly interesting. According to Bohr the key point is that, in contrast with the situation in classical physics, in quantum mechanics it is no longer possible to sharply distinguish between the autonomous behaviour of a physical object and its inevitable interaction with other bodies serving as measuring instruments.[69]

> We are faced here with an epistemological problem quite new in natural philosophy, where all description of experiences so far has been based on the assumption, already inherent in the ordinary conventions of language, that it is possible to distinguish sharply between the behaviour of objects and the means of observation. This assumption is not only fully justified by everyday experience, but even constitutes the whole basis of classical physics … [In light of this situation] we are, therefore, forced to examine more closely the question of what kind of knowledge can be obtained concerning objects. In this respect, we must … realize that the aim of every physical experiment—to gain knowledge under reproducible and communicable conditions—leaves us no choice

[66] N. P. Landsman, 'When champions meet: Rethinking the Bohr— Einstein debate', *Studies in History and Philosophy of Modern Physics* 37 (2006): 212 - 42.

[67] Ibid., 216.

[68] Abraham Pais, *The genius of science* (Oxford: Oxford University Press, 2000), 23.

[69] Kristian Camilleri, 'Why do we find Bohr obscure? Reading Bohr as a philosopher of experiment', in Jan Faye and Henry Folse, eds., *Niels Bohr and the Philosophy of Physics—Twenty First Century Perspectives* (London: Bloomsbury Academic, 2017), 19-46; 29.

> but to use everyday concepts, perhaps refined by the terminology of classical physics, not only in accounts of the construction and manipulation of measuring instruments but also in the description of actual experimental results.[70]

> … The argument is simply that by the word 'experiment' we refer to a situation where we can tell others what we have done and what we have learned and that, therefore, the account of the experimental arrangement and of the results of the observations must be expressed in unambiguous language with suitable application of the terminology of classical physics.[71]

Bohr's focus on the necessity of classical concepts could be characterised as an articulation of the need for a quantum 'economy' of knowledge where we have to give up any attempts to talk about the inner nature of quantum objects and focus on what we can learn about them through the objective description of the experimental situation by the linguistic means of classical physics — the only way accessible to us to share our personally acquired experience and knowledge.

A theological analogy that helps in reconciling Einstein's and Bohr's positions

Landsman's article appears to be particularly relevant to our discussion. The author is a well-known theoretical physicist[72] who, most interestingly, employed a theological argument to enlighten the disagreement between Einstein and Bohr:

> More importantly, the agreement between Einstein and Bohr on the solution to the problem of objectification in quantum theory paves the way for an identification of their exact disagreement

[70] Niels Bohr, 'Natural Philosophy and Human Cultures', in *Atomic Physics and Human Knowledge: The Philosophical Writings of Niels Bohr*, Vol. II, Essays 1932-1957 (Woodbridge, CT: Ox Bow Press, 1987), 23-31; 25.

[71] Niels Bohr, 'Discussions with Einstein on epistemological problems in atomic physics', in P. A. Schilpp, ed., *Albert Einstein, Philosopher-Scientist: The Library of Living Philosophers*, Vol. 7 (Evanston, IL: Open Court, 1949), 201-241; 209.

[72] https://scholar.google.co.uk/citations?hl=nl&user=PTyjucMAAAAJ&view_op=list_works&sortby=pubdate

> on the issue of the (in)completeness of the theory. Namely, the technical parts of their debate on the (in)completeness of quantum mechanics just served as a pale reflection of a much deeper philosophical disagreement between Bohr and Einstein about the knowability of Nature. For Bohr's doctrine of classical concepts implies that no direct access to the quantum world is possible, leaving its essence unknowable. This implication was keenly felt by Einstein, who in response was led to characterize his opponent as a 'Talmudic philosopher'.[73]

Landsman showed how astute the characterization of Bohr as a Talmudic philosopher was through a theological analogy comparing Bohr and Einstein with Maimonides and Spinoza, respectively, on the unknowability of God. Bohr insisted that the formalism of quantum theory provided a complete description of physics and accepted as a given the incompleteness of the knowledge the theory provides. This for Einstein was equivalent to a mere acceptance of ignorance. He was most probably following Spinoza (Einstein's intellectual engagement with Spinoza's thought is well known), who spoke about the 'complacency of ignorance' in reference to the scholastic philosophers who defended the unknowability of God.[74]

In a letter to Schrödinger from 19 June 1935, Einstein portrays Bohr as follows: 'The Talmudic philosopher doesn't give a hoot for 'reality', which he regards as a hobgoblin of the naïve'.[75] According to Landsman, the 'Talmudic philosopher' label reveals the true and insurmountable disagreement that is manifested in the opposition between Einstein's claim that 'God doesn't play dice with the world',[76] and Bohr's reply to him that he 'should stop telling God what to do'.[77]

[73] Landsman, 'When champions meet', 218. Landsman refers to A. Einstein, Letter to Erwin Schrödinger (June 19, 1935), in A. Fine, *The Shaky Game: Einstein Realism and the Quantum Theory* (University of Chicago Press, Chicago, 1986), 35.

[74] Alan Donagan, 'Spinoza's theology', in *The Cambridge Companion to Spinoza*, ed. Don Garrett (Cambridge: Cambridge University Press, 1995), 343 - 82; 347.

[75] Don Howard, 'Einstein on locality and separability', *Studies in History and Philosophy of Science* 16 (1985): 171 – 201; 178 (Howard's translation).

[76] See note 82.

[77] Landman refers to R. Kroehling, *Albert Einstein: How I see the world* (PBS Home Video, 1991). In the video, Abraham Pais says about Einstein that 'he had a certain type of arrogance. He had a certain belief that—not that he said it in those words but that is the way I read him personally—that he had a sort of special pipeline to God, you know. He would always say that God doesn't play dice to which Niels Bohr would reply "but how do you know what God's doing?"'

As Landman indicates, some of the commentators on the Bohr-Einstein debate 'tend to put Einstein in the Talmudic tradition, leaving Bohr at the side of Eastern mysticism (a case supported by Bohr's choice of the yin-yang symbol as the emblem of his coat of arms following his Knighthood in 1947)'. Others will emphasize that Bohr was not religious and did not believe in the existence of a 'God's-Eye View' on quantum reality.[78]

The theological analogy suggested by Landsman 'is between the knowability of Nature in physics, as limited by Bohr's doctrine of classical concepts, and the knowability of God in theology, highly restricted as the Old Testament claims it to be. Indeed, Bohr's idea that the quantum world can be studied exclusively through its influence on the ambient classical world has a striking parallel in the 'Talmudic' notion that God can only be known through his actions'.

To illustrate this analogy, Landsman quotes from Maimonides' *Guide of the Perplexed*:

> THAT first and greatest of all thinkers, our teacher Moses, of blessed memory, made two requests and both his requests were granted. His first request was when he asked God to let him know His essence and nature; the second, which was the first in point of time, was when he asked Him to let him know His attributes. God's reply to the two requests was to promise that he would let him know all His attributes, telling him at the same time that they were His actions. Thereby He told him that His essence could not be apprehended in itself, but also pointed out to him a starting point from which he could set out to apprehend as much of Him as man can apprehend.

This quotation correlates with Bohr's view, in which the philosophy of quantum theory is 'bound up with the impossibility of man's knowing himself, and his not being able to know the external world completely because he himself was a part of the external world'.[79]

[78] David Farvholdt, 'Niels Bohr and realism', in *Niels Bohr and Contemporary Philosophy*, eds. Jan Faye and Henry Folse (Dordrecht: Kluwer Academic Publishers, 1994), 77 - 96; 88.

[79] See the statement of Sir Nevil Mott, who visited Bohr's Institute in 1928 and wrote in a letter to his mother of October 6, 1928: '...and so Bohr began to talk about the Philosophy of the Quantum Theory and how it was all bound up with the impossibility of man's knowing himself,

One of the nicely surprising features of Landsman's theological analogy is its correspondence with some of the key insights of Orthodox theology with respect to the distinction between the unknowable Divine essence and the knowability of the God's energies or activities. Examining the relationship between the Talmudic and the Eastern Christian understanding of the distinction between divine essence and energies is beyond the scope of the present study. We can only mention that a link between the two traditions could be found in Philo of Alexandria (c. 20 B.C.E. - 40 C.E.), a Hellenized Jew who spanned two cultures, the Greek and the Hebrew. For him the divine essence is strictly unknowable, and God is known through his powers, which he identifies with the divine glory.[80] 'Philo's metaphysics, rooted in the antinomy between divine transcendence and immanence, begins with the distinction between God's incommunicable divine essence and his participable divine operation, or energy'.[81]

Landsman's analogy indicates the potential of the essence-energy distinction as an exploratory lens in the interpretation of the debate between Einstein and Bohr. This is a unique example of a theological insight that could offer a deeper understanding of the apophatic, the interpretation of quantum physics, as well as a great example of an insight that could be enhanced through the adoption of the ACTA approach.

The QBist interpretation of quantum mechanics — a basis for a deeper encounter with theology

and his not being able to know the external world completely because he himself was a part of the external world'. Reference provided by David Farvholdt, 'Niels Bohr and realism', 90.

[80] David Bradshaw, Aristotle East and West—Metaphysics and the Division of Christendom (Cambridge University Press, 2004), 59 - 64; John Dillon, The Middle Platonists, Second Edition (Ithaca: Cornell University Press, 1996), 155 - 70. See also Philo of Alexandria (c. 20 B.C.E.— 40 C.E.), Internet Encyclopedia of Philosophy https://www.iep.utm.edu/philo/: 'Philo produced a synthesis of both traditions developing concepts for future Hellenistic interpretation of messianic Hebrew thought, especially by Clement of Alexandria, Christian Apologists like Athenagoras, Theophilus, Justin Martyr, Tertullian, and by Origen. He may have influenced Paul, his contemporary, and perhaps the authors of the Gospel of John (C. H. Dodd) and the Epistle to the Hebrews (R. Williamson and H. W. Attridge). In the process, he laid the foundations for the development of Christianity in the West and in the East, as we know it today'.

[81] Tikhon Alexander Pino, 'An essence— energy distinction in Philo as the basis for the language of deification', *The Journal of Theological Studies* NS 68, no.2 (2017): 551 - 71.

According to David Mermin, a recent interpretation of quantum mechanics, called QBism, is 'by far the most interesting game in town.'[82] It was suggested by Carl Caves, Chris Fuchs, and Rüdiger Schack, and builds on many of the insights of the founders of quantum theory. According to Caves, Fuchs and Schack, the confusion at the foundations of quantum mechanics arises out of a confusion about the nature and meaning of probability. The dominant view among physicists is the frequentist view of probability: probabilities describe objective properties of ensembles of identically prepared systems. Caves, Fuchs, and Schack take a personalist Bayesian view: An agent assigns a probability p to a single event as a measure of her or his belief that the event will actually take place.[83] They maintain that, if probability is understood in this way, the notorious quantum paradoxes either disappear or assume less problematic forms.

The personalist Bayesian view of probability has profound implications for the meaning of quantum mechanics, which Fuchs and Schack call quantum Bayesianism, hence its name — QBism. Since quantum states are used to determine probabilities, if probabilities are indeed assigned by an agent to express this same agent's degree of belief, then the quantum state of a physical system is not objectively inherent in that system but assigned by an agent or observer to encapsulate her or his beliefs about it in a future experiment or observation. Quantum state assignments, like probabilities, are relative to a specific agent. We could say therefore that QBism offers a fundamentally personalist perspective on quantum mechanics.

The QBist way of understanding probabilities in terms of the content, limitations and anticipation of personal information acquired in our personal interactions with the world around us helps in highlighting the value of quantum mechanics for science in general and for the human sciences in particular. 'It can help us see quantum mechanics, not as an anomaly in the space of physical theories, but rather as their deepest archetype.'[84] This is because quantum theories

[82] N David Mermin, 'Fixing the shifty split', in *Why Quark Rhymes with Pork: and Other Scientific Diversions* (Cambridge: Cambridge University Press, 2016), 219-226; 222.

[83] https://en.wikipedia.org/wiki/Thomas_Bayes#Bayesianism

[84] Michel Bitbol, 'Why should we use quantum theory? The case of human sciences', in *Quantum Interactions* 2018, eds. B. Coecke and A. Lambert-Mogiliansky, LNCS 11690 (2019), 3 - 21, 3. https://doi.org/10.1007/978-3-030-35895-2_1

are not to be understood as an indirect representation of some reality beyond the phenomenal level of experimental information, but as a direct expression of the fundamental bounds of the availability of such information — something that could be considered as a common to both quantum mechanics and human sciences:

> One case is especially striking: it is a recent generalization of quantum theory that applies to several domains of the human sciences such as decision theory, semantics, and the psychology of perception. This application of quantum theory to the human sciences shows that no matter who or what responds (human beings or things), the probabilistic structure that is to be used to anticipate the responses is the same. A set of human beings making choices that depend on the options which are presented to them, and on the order of the decisions to be taken, behave exactly like a set of electrons on which one evaluates several incompatible observables. … There is nothing shocking about the fact that it should be so. For this implies strictly nothing about some alleged similarity between electrons and humans at the level of their profound being. There is only a formal isomorphism between the possibilities of epistemological access to electrons and to humans: an isomorphism[85] of their phenomenal reactions to being solicited, and of their informational dispositions. Such universal applicability of quantum theories … strongly suggest that these theories are precisely that, and only that: a general procedure for anticipating probabilistically the replies to context-dependent experimental solicitations. They do not even offer a hint in the quest of a faithful representation of some independent reality out there, behind phenomena.[86]

Christopher Fuchs — the most articulated proponent of QBism, suggested an ontology of participatory realism that was inspired by John Wheeler's post-Bohrian idea that quantum mechanics involves

[85] Interestingly, Michel Bitbol uses the term *isomorphism*, which reminds of the analogical isomorphism approach discussed earlier in the present text.

[86] Michel Bitbol, 'A Phenomenological Ontology for Physics,' in *Phenomenological approaches to physic*, eds. Harald Wiltsche & Philipp Berghofer (Heidelberg: Springer, 2020), hal-03039509; 3-4.

'observer-participancy'. According to Wheeler, 'The strange necessity of the quantum as we see it everywhere in the scheme of physics comes from the requirement that—via observer-participancy—the universe should have a way to come into being.' Fuchs agrees that each act of observer-participancy is an act of creation which brings out the reality of the world of which we can actually speak about.[87]

The current status of the development of quantum mechanics suggests that there is no such thing as a reality independent of us and our agency. We should therefore give up any attempts for representation and devote our efforts to making sense of the participatory reality of the quantum realm simply because we can not speak of what there is as if we were describing it from outside.

> Participatory realism is truly useful, because it sketches the only conception of reality that is immediately compatible with quantum mechanics, and by doing so satisfies our want for mental pictures without indulging in wrong representations. Indeed, this mental picture is the only one that fully acknowledges the core reason of Bohr's prohibition of global ontological representations in quantum mechanics. It is a mental picture of the reason of the inadequacy of pictures. We could also say that participatory realism succeeds because it does not ascribe 'reality' any positive predicate, but only a negative predicate: the impossibility of neatly splitting it into a spectator-like knower and a play-like known. This introduces us to what may be called 'negative metaphysics', similar to the famous (or infamous) 'negative theology'. In the same way as 'negative theology' may be taken by some as a good reason to abstain from theology, 'negative metaphysics' may be taken by some (the instrumentalists) as a good reason to abstain from metaphysics.[88]

In his most recent publication Fuchs makes an explicit reference to the apophatic method:

[87] According to Bitbol (see footnote above), this could be considered as an anti-metaphysical move inspired by Wittgenstein's famous statement that 'What we cannot speak about we must pass over in silence'.

[88] Bitbol, 'A Phenomenological Ontology for Physics,' 12.

> In fact the first phase of QBism might be likened to a grand exercise in apophatic method: We won't yet tell you what reality is, but what it is not. In particular, on the supposition that probabilities … are not part of reality, after careful analysis, we'll tell you lots of other things that cannot be part of it either. In this way, first the quantum state fell as a potential element of reality, then more surprisingly the operators used to describe quantum measurements, and then perhaps even shockingly Hamiltonians and unitary operators. So it went with nearly every individual term of the theory.[89]

It appears therefore that quantum mechanics has reached a moment when it needs to adopt explicitly an apophatic attitude to reality (i.e., an apophatic realism). This is a realization that offers an opportunity to explore further the contextual similitudes (a term suggested by Fr John Breck as a better alternative to 'analogy')[90] between Orthodox theology and quantum mechanics.

Conclusion

In concluding we can surmise that one of the most interesting similitudes between theology and quantum physics appears to be related to the ways apophaticism plays a role in them. This issue touches on some of the deepest epistemological aspects of these two domains. A closer look at the controversial issues shows a common need to go beyond the challenges of representation, assertion and negation to the epistemological conditions of knowledge emerging through personal union and participation. This trend is more sharply expressed in Orthodox theology where theologians have emphasized that such union and participation in the Divine life removes the need for any representation, be it positive or negative, of the Divine and establishes apophaticism as way of communion in existence. The apophatic does not emerge as a comment on representation, but as an opportunity for

[89] Christopher Fuchs, 'QBism, Where Next?', *arXiv:2303.01446 [quant-ph]*, March 10, 2023: 1-53, p. 2: https://doi.org/10.48550/arXiv.2303.01446.

[90] Fr John Breck, *Beyond These Horizons, Quantum Theory and Christian Faith* (Alhambra, CA: Sebastian Press; Wadmalaw Island, SC: Kaloros Press, 2019), 70.

participation. It allows talk about an apophatic realism which focuses on the subtleties and the quality of participation instead of the need for negation in speaking about the Divine realities.

According to Richard Healey, 'quantum theory makes a radical break with previous physics not because of the weirdness of the physical behavior it represents, but … (because) quantum theory is simply not in the business of representing what happens in the physical world'[91] We have seen Heisenberg's comment on Bohr's challenges of using language in addressing the new epistemological situation in quantum physics where he tried to keep the words and the pictures of classical physics 'without keeping the meaning of the words and of the pictures, having been from his youth interested in the limitation of our way of expression, the limitation of words, the problem of talking about things when one knows that the words do not really get hold of the things'.[92] Bohr's focus on the need of using classical concepts is a manifestation of the need for an 'economy approach' to quantum knowledge that could be compared to a similar approach in theology — the focus of our theological epistemology on what was made accessible to us through the person and the activities of Jesus Christ, the Son of God, and through the gifts of the Holy Spirit in the history of salvation, instead of focusing on reflections about the Holy Trinity which remains inaccessible to us in its essence. This original apophatic insight of quantum physicists was fundamentally enhanced by the current QBist interpretation which brings its participatory realistic perspective very close to the characteristics of the apophatic realism that was described above.

A last point about the concept of probability. It is obviously a technical term that has been naturally associated with quantum physics. Does it have a place in theology? I believe that the QBist personalist Bayesian view on probability offers an opportunity for theology to explore the potential value of the adoption of such perspective in a theological context. For example, the personalist Bayesian view on probability could relate to the context of prayer. I know this may sound strange to many Christians but let's take a moment and think about it. Our prayers emerge from the depths of our personal existential situations.

[91] Richard Healey, *The Quantum Revolution in Philosophy* (Oxford: Oxford University Press, 2017), 3.

[92] Chevalley, 'Niels Bohr's Words and the Atlantis of Kantianism', 33.

But there is no determinism in our prayers. In the Gospel of Matthew 7:7 our Lord and God Jesus Christ said: 'Ask, and it will be given to you; seek, and you will find; knock, and the door will be opened to you. For everyone who asks receives; he who seeks finds; and to him who knocks, the door will be opened.' But nobody says that what we will receive will be what we have actually asked for. God's thoughts are not our thoughts, neither are our ways His ways (Isaiah 55:8). He is the One having the best answers for us even though we may have not seen them in advance as such. In this sense, our prayers are an expression of our personal beliefs about our best future, i.e. beliefs based on our personal experience and existential context. God respects our freedom and can satisfy all our requests, but He does also have a plan for us that may not result in what we have actually asked for in a particular moment of time. This is a point that would definitely benefit from a more comprehensive theological elaboration in future studies.

We can continue to deep dive into the exploration of the similitudes emerging from the application of the ACTA approach. The present article should be considered as an invitation to such deeper exploration. The ACTA approach counts on the participatory engagement of the reader in making the connections and personally exploring any other emerging similitudes between Orthodox theology and quantum physics.

Christian scientific apologetics in the 21st century

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The advances in science during the last two centuries challenged some basic Christian doctrines - in particular, the doctrine of creation. Many Christians in the Western world engaged actively in development of "scientific apologetics", i.e. apologetics in the field of science, and initiated debates on the fundamental theories of contemporary cosmology (the Big Bang theory) and biology (evolution of life). What are the key positions of scientific apologetics now, as the frameworks of these theories seem to be experimentally confirmed and established in the scientific communities worldwide? I argue that a consistent scientific apologetics shall not take a side in the disputes on the *purely scientific* problems of theories but rather focus on the *worldview* questions which these theories lead to. As examples, I will briefly review two issues in astrophysics that raise in-depth worldview questions: the beginning of the Universe and its fine tuning ("anthropic coincidences"). Also, a worthwhile for a scientific apologist is to elucidate the common historical roots of science and theology (in the prescientific era) and to show that they are not only of historical interest – indeed, their interaction and complementarity allow for building up a holistic, deeply satisfying view on reality.

A personal introduction

My personal struggle with the supposed contradiction between science and Christian faith was initially internal: I became a Christian believer as being a second-year university student in Physics and desperately needed a clear understanding whether of my new faith is compatible with a scientific career. People who know life under Communism from experience and the propaganda images of religion as incompatible with science, can imagine what kind of processes took place in me. Later the struggle became external: the expectation (from fellow Christians)

was that I — being a scientist — *must* develop scientific apologetics to 'combat the atheistic theories' of evolution (cosmic and biological). This personal story is illustrative of the confusion in the minds of people with different beliefs (religious or non-religious) caused by the notion of war between science and religion (in particular, Christianity).

My understanding of apologetics: substantiation, application and enrichment (broadening) of a genuine Christian worldview which is capable of being communicated both to unbelievers and believers. Apologetics is not merely a method to defend the Christian faith or to prove its basic claims neither a kind of catechism with ready-made answers to difficult questions of unbelievers. It is *a Christian dialogue with the world in its variety* and both sides in this dialogue can and should learn from each other. I am convinced that a Christian has nothing to fear from in the course of such dialogue — the world is God's creation and belongs to God and the believer's interaction (including debates) with the world eventually would teach him or her something about the richness of God's purposes and works in the life of man. In this framework 'scientific apologetics' has to deal, on the one hand, with comprehension of science as a unique human enterprise and with evaluation of the theological significance of its discoveries. The underlying conviction should be that the efforts to understand and interpret them would reveal something more about the greatness and wisdom of the Creator. On the other hand, the other main task of a Christian scientific apologist is to demonstrate: i) that the picture of nature revealed through scientific investigation is in agreement with the framework of Christian theology; and ii) that scientific knowledge itself is not able to give answers to the most important worldview questions but instead 'fuels' them. In this talk I will attempt to outline some prospects and threats for a meaningful scientific apologetics in the twenty-first century.

1. The 'science vs. religion' issue: origin and reactions

First I'd like to discuss briefly the historical origin of the so-called 'Science vs. Religion' issue, this influential narrative about the age-old animosity between science and institutionalised religion which allegedly was always impeding scientific enterprise. In my view, this narrative is

a difficult intellectual heritage from the modern era and one has to refute it thoroughly so that scientific apologetics can be possible at all.

1.1 From natural philosophy to science

Interestingly enough, at the root of the issue 'science vs. religion' is the birth of modern science itself in Europe in the 16th — 17th century (the first scientific revolution). This was an epoch highly-laden with theological discussions available to many people — just to mention the Protestant Reformation and the Counter-Reformation. The process of laying the foundations of science cannot be separated from this spiritual atmosphere. In fact, the writings of the 'fathers' of different scientific branches (Galileo, Kepler, Newton, Boyle, Linnaeus) are full of essentially theological reflections. Some of the basic principles of modern science were derived from the Christian doctrines of creation and man: rationality of nature, universality of its laws, man's capability to discover them and his authority to perform experiments in creation.[1] One can add here the understanding – especially cherished by the Protestant reformers and later by the Puritans[2], [3] — that the devotion to 'natural philosophy' is worthy of appraisal and serves for the glory of God. Together with the affluent scientific discoveries of the time, all these factors contributed to the separation of natural philosophy from the 'main body' of philosophy and religion. Subsequently, *natural philosophy was transformed into science* in the contemporary sense of this word — with its clearly distinctive field, language (scientific notions), methodology and models.

In the context of the endless theological controversies and wars in the name of religion throughout seventeenth century in Western Europe, the amazing success of scientific approach led many people to the idea that this might be the new and the only secure way to establish truth. A more subtle manifestation of this *zeitgeist* was the notion that the field of a scientist is universal in scope (the objective truth valid for all) while

[1] Nancey R. Piercey, Charles B. Thaxton, *The Soul of Science. Christian Faith and Natural Philosophy*, (Wheaton, Illinois: Crossway Books, 1994), 17-42 (Ch. 1).

[2] John Dillenberger, *Protestant Thought and Natural Science*, (Garden City, New York: Doubleday & Co., 1960), 128-132.

[3] Charles Webster, Puritanism, Separatism and Science, 1986, in *God and Nature*, eds. David Lindberg, Ronald Numbers, (Berkeley, California: University of California Press, 1986), 192-217.

that of a priest/pastor is mostly to enlighten on moral issues and church doctrines. The latter seem to become increasingly a matter of personal beliefs (i.e. not of general interest). Thus the emerging popular image of modern science diminished the significance of the Church and the religion altogether concerning human knowledge.

1.2 Scientism: science as a weapon of ideology

It is questionable whether this cultural development was the chief historical reason for the birth of scientism. But it is certain that prominent philosophers of the Enlightenment took advantage from it in order to propose their agenda against Christianity. In the eyes of many of their contemporaries, science had gained credibility as the main force to change the world. So people like Voltaire, Marquis de Condorcet, Montesquieu, Comte etc. presented world history as a continual and continuing progress and perfection of human nature through the increase of positive/scientific knowledge which supposedly would eventually substitute any religious worldview.[4] In other words, they attributed to science a mission which goes far beyond its field and goals. Newly emancipated from philosophy in general, science was — figuratively speaking — 'called under the battle flags' to serve to the purposes of a new, militant secularist philosophy. Christianity was stylized as the enemy of this movement towards well-being as testified by the long period of the 'Dark Ages', an impressive pejorative notion coined to signify medieval culture.[5] It is important to note that no one of those influential thinkers was a scientist; at least, science was not his main activity. For those thinkers science was not a calling but a weapon to fight the Christian worldview and culture with. And of course, they used and still use each scientific achievement which seems to be inconsistent with the Biblical account to attack Christianity: e.g. the Big-Bang cosmology and the theory of evolution of life.

The scientistic narrative has been successfully refuted by a number of historians of science as anti-historical and propagandistic in its

[4] David Lindberg, Conceptions of the Scientific Revolution, in *Reappraisals of the Scientific Revolution*, (Cambridge, UK: Cambridge University Press, 1990), 6.

[5] Carl L. Becker, *The Heavenly City of the Eighteenth-Century Philosophers*, (Yale, Connecticut: Yale University Press, 1932), 105-108.

essence,[6] lacking interpretative power within the historical context[7] and as 'vulgar triumphalism' which divides history into heroes and villains.[8] But such a critical approach to scientism and its unmasking as an ideology is hardly the case outside some circles of experts. The scientistic narrative has been successfully and increasingly popularised since the second half of the nineteenth century (see Draper[9] and White[10]) up to nowadays (Dawkins). Its influence is maintained through the most high-school textbooks which typically offer only a chronology of scientific discoveries but *do not discuss the philosophical and/or religious roots of the scientific ideas*. They tend to present a linear historical development of science, keeping silent about errors, false concepts and dead-ends along the way. Thus the warfare picture of the relationship 'science vs. religion' was strengthened and different Christian groups and theologians played a non-negligible role in this process.

1.3 Christian reactions to scientism

There is a large variety of Christian reactions to the advance of the scientistic agenda in Western societies. It would be far beyond the scope of this report to discuss them in detail. I would rather mention *three trends* that deserve special attention. Two of them accept, in a direct or indirect way, the image of warfare between science and Christianity and operate principally within its framework.

The most influential trend on popular level — in particular in the USA, — is *fundamentalism*. Originally, in the first half of the twentieth century, this movement gained momentum as a strong reaction to the liberal Protestant theology, at that time extensively imported from Germany in the American theological seminaries. Warning against the theological misconceptions of the 'modernists' (i.e. the liberals), the fundamentalists instead called the believers to stick to the 'fundamentals

[6] Thomas Kuhn, The Relations between History and History of Science, in *Historical Studies Today*, (New York: W. W. Norton, 1972).

[7] Mary Hesse, *Science and Human Imagination: Aspects of the History and Logic of Physical Science*, (New York: Philosophical Library, 1955), 10.

[8] Robert Westman, Proofs, Poetics and Patronage, in *Reappraisals of the Scientific Revolution*, (Cambridge, UK: Cambridge University Press, 1990), 169.

[9] John W. Draper, *History of the Conflict between Religion and Science*, (New York: D. Appleton, 1875).

[10] Andrew D. White, *A History of the Warfare of Science with Theology*, (New York: Dover Publications, 1960).

of faith', for instance to the doctrines of original sin, resurrection, atonement, divine inspiration and inerrancy of the Scripture. Obviously, these 'fundamentals' did not refer to the age of the Universe and of the Earth, to the evolution of life and of living organisms, to the mechanism of natural selection etc. In fact, the Darwinian controversy and the revolution in cosmology were not so important for the early American fundamentalism. Moreover, some of the leaders of this movement (such as J. Orr and B. Warfield) sought to harmonise their conservative theological view with the evolutionary theory.[11] Later the situation changed. The movement became increasingly dominated by adherents of the so called *dispensationalism*, an essentially eschatological view which stresses enormously the sinfulness of man, the moral decay in the modern secular society and the Second Coming of Christ. The result was practical lack of interest to the developments in culture and science (see M. Knoll); they were viewed through the glasses of a literal interpretation of the Bible and perceived, in principle, as threats to the spiritual life of a devoted Christian. In the second half of the 20th century fundamentalism was actively engaged in the raging 'culture wars' in American society. Realising that the church is going to lose the battle for the minds of the younger generation and of educated people altogether, some fundamentalists with an academic background elaborated whole systems to refute the mainline contemporary theories in biology and astronomy: the so called young-Earth creationism (which seeks extensive support from the Bible) and Intelligent Design (ID; without reference to the Bible). Both demonstrate the point I made above: the image of warfare between science and Christianity has been accepted and the battles take place on the scientific field. Later I will comment briefly how scientific are the means used in those battles.

A second trend which seems to operate within the image of the supposed (sometimes hot, sometimes warm) war between science and theology, is the recognition of the *dichotomy* between the two and insistence on the treatment of both within a strictly drawn limits in terms of goals and methods. This trend is based on the historical separation of natural philosophy from theology mentioned above. In contrast to

[11] David N. Livingstone, *Darwin's Forgotten Defenders: The Encounters between Evangelical Theology and Evolutionary Thought*, (Grand Rapids: Eerdmans and Scottish Academic Press, 1987).

fundamentalism, it respects science as a unique human pursuit with undisputed and proven contribution to our increasing knowledge of reality. Compared to religion, science has a quite different approach and, also, quite different topics: for instance, it can say nothing on God's character or on issues of ethics. So, it should not be conceived as a competitor to any faith but rather as unrelated to the religious worldview altogether. On the part of non-religious scientists, this trend is exemplified by the American paleontologist Stephen Jay Gould who formulated the so called 'principle of non-overlapping magisteria' referring to science and religion: "Each subject has a legitimate magisterium, or domain of teaching authority — and these magisteria do not overlap… The net of science covers the empirical universe… the net of religion extends over questions of moral meaning and value."[12] In other words, science and religion can be conceived as unique tools to handle separate aspects of reality. On the part of theologians who are proponents of this concept, one could mention the 'two-realms approaches' to the doctrine of creation by some representatives of the twentieth century Protestant theology (such as Bultmann and Tillich). In their interpretation, the doctrine of creation is not a description of particular event but rather a "basic description of the relation between God and the world", a symbolic expression of timeless truth.[13] Figuratively speaking, this approach apparently attempts to preserve a 'holy land' for theology which cannot be invaded by scientific explanation.

The third main contemporary trend in the Christian reactions to scientism tries consecutively to get rid of the warfare imagery in the relationship science vs. religion. Indeed, it seeks to establish a *fruitful partnership* (*or at least, dialogue*) *between scientists and theologians* which can possibly lead to a more comprehensive and informed worldview. I would say that this approach is an attempt to return to the spirit of the pre-scientific era (at least in Christian Europe): in terms of the quest for a non-separated, holistic view on reality and of respect to the scientific endeavor as stemming from the God-given capability and function of man to understand and cultivate the world. From this perspective, science in its essence cannot be a threat for the Christian faith since it has been positively sanctioned by the Creator since the very

[12] Stephen J. Gould, Non-overlapping magisteria, *Natural History* 106 (1997): 16-22.
[13] Paul Tillich, *Systematic Theology*, (London: Nisbet, 1953), 280-281.

beginning of human race; even more, it is part of His plan for humanity as a knowledgeable, wise and responsible governor (*oikonomos*) of His creation. The separation of science from theology was a necessary and helpful, 'technical' step in the historical development but should be in no way viewed as a necessary separation in the mind and in the perception of reality, let alone as a harbinger of a new evolutionary stage of humans when they are supposed to get to know this reality only by scientific means. In the words of H. van Till, science and theology should not 'function in isolation from one another, but [be] *partners in theorizing* — each engaged with a constructive effort to make its own contribution toward a better understanding of the nature of humanity and of the universe that we inhabit'.[14] In general, this concept is in agreement with my personal understanding of how one should address the 'science vs. religion' issue as the heritage from the modern era.

2 Does contemporary Christianity need scientific apologetics?

In view of the considerations so far, the answer to this question can be summarised fully in the suggestive phrase 'Yes, but…'. 'Yes' is required by the claims of Christianity to offer an all-encompassing worldview, a view about the Creator and His purposes in the created Universe and about humanity, its potential and its future. One can hardly imagine a relevant Christian response and approach to the twenty-first century culture without taking into account the global changes and the changes in human mentality brought by the development of science and the diversity of possible changes in the future.

The 'but' part of the answer represents a few necessary specifications:

- Christian scientific apologetics should not be perceived as a forced response to threats for the faith posed by science. The 'science vs. religion' issue has to be recognised as *strongly influenced by the culture wars* in the last two and a half centuries between secularists and proponents of Christian norms (but not necessarily of personal Christian faith!) in Western societies. One does not need the framework 'science vs. religion' at all — to put it mildly, — to address problems

[14] Howard van Till, Science and Christian Theology as Partners in Theorizing, in *Science and Christianity. Four Views*, (Downers Grove, Illinois: InterVarsity Press, 2000), 198.

raised by contemporary science from the theological perspective.

- Scientific theories and/or discoveries have the potential to inspire philosophical conflicts, i.e. debates on worldview questions. However, those theories are not the main reasons for worldview debates referring to science. The main reason, of course, is *the deeply human quest for truth, for satisfaction of our deepest longings*. This is true for every human being, including a scientist. Therefore, as a first step to taking a stance on a scientific theory or problem, a Christian apologist must properly distinguish between science, a worldview of an individual scientist and the ideological use of science (e.g. scientism) and articulate this. For example, people like Richard Dawkins, P. W. Atkins and the late Francis Crick are notorious with their scientistic and strongly anti-theistic views. However, the latter are offered to the general public in the form of lectures and books claimed to be just popularisations of modern science. Answers to metaphysical questions regarding purpose, meaning, value, source of existence are treated in this context as if they are self-evident or easily derivable from straightforward and doubtless extensions of scientific reasoning.[15] This hidden agenda should be unmasked, preserving the appreciation of the efforts to popularise science.
- In case a particular scientific theory poses a real challenge to Christian doctrines or worldview, the good apologists should be cautious to *avoid the fallacy I label 'crossed levels of confrontation'*. Worldview debates which involve science run in principle on two levels: philosophical (on questions such as completeness, adequacy, self-consistency) and scientific (looking for support from the implications of particular theory). Of course, the scientific level includes necessarily permanent evaluations of the theory in question and, hence, indirectly, purely scientific debates in which a theory is opposed by other theory/ies. To 'cross the levels

[15] Ibid., 201.

of confrontation' means to make an illegitimate jump from one of the levels to the other and to confront e.g., a theory by philosophical/theological means. Instead of confronting the opposing worldview which refers to some scientific theory, one attacks the theory itself. A typical example is the approach chosen by S. Wilberforce in his assault on T. Huxley in the famous first debate over Darwin's theory of evolution and further efforts to refute this theory by direct or indirect quotations from the Bible. An example for 'crossed-level confrontation' in the opposite direction are the attacks of R. Dawkins against Christian doctrine with arguments from contemporary evolutionary biology. Interestingly enough, the figure of Darwin has been increasingly viewed as the main foe of Christianity in many Protestant churches while the philosophers who used his theory for their agenda have been left somehow in the background. In the same vein, scientists who work in the framework of the standard Big-Bang cosmology or of biological evolution are automatically stamped as 'atheistic/materialist scientists'. Such a type of bad scientific apologetics is a remarkable 'own goal' (in football terms) contributing to the caricature of religion as the 'arch-enemy' of science which denounces its recent developments.

- The 'crossed-level confrontation' sets temptations to look for (quasi-)scientific counter-arguments. Indeed, to refute a theory, one should either develop one's own models (providing tests for their validity) or, at least, point out their inconsistencies or failures. Examples of such consecutive approaches are the 'Creation science institute' of the young-Earth creationists and the arguments of the ID proponents. In most cases, such approaches are rightly attacked as 'preaching of a God of the gaps' (in human scientific knowledge).
- Last but not least, a sound apologetics in the field of science needs a *sound, historically relevant interpretation of Biblical notions and ideas that seem to convey scientific truths*. I stress the word 'seem to' since to understand the relation of the Biblical narrative to a scientific picture of the world is a problem worth of in-depth investigation itself. The main

source of confusion on this issue is the presupposition that the Bible aims to offer us 'models' of creation.

Now, let's return to the 'yes'-answer to the question about scientific apologetics and to bring some arguments in its support. An all-encompassing worldview recognises and is fuelled by worldview questions that arise from human experience with reality. The theories and the discoveries of contemporary science provoke many questions about human origin and destiny, about meaning and purpose in nature — questions of increasing complexity in comparison with the cultural situation one century and even several decades ago. An important task for a scientific apologist is to highlight them and to demonstrate that they are in fact *worldview* questions, i.e. which go beyond the limits of science. This very effort would already be a good job done; the objective in a follow-up discussion would be to show that the Christian answers to these questions make sense and are more satisfying then the alternatives. (Indeed, this is the general task of apologetics, not only in the field of science.) Moreover, Christian apologists could point out that some insights of modern science could enrich theological reflections and enable an in-depth understanding of the Biblical doctrine of creation and humanity. Let's take for example two achievements of modern cosmology.

3 Worldview questions posed by recent scientific progress: two examples

3.1 The Big Bang cosmology

The twentieth century witnessed both the birth of cosmology as physical science and its very turbulent 'youth'. Within several decades, perhaps without precedents in the history of science, theoretical considerations and numerous observations lent mutual support for creation and elaboration of an extended and successive model of cosmic evolution. It was originally labeled 'Big Bang cosmology' by its opponents who strove to retain the picture of an eternal or steady-state universe. Their attempts failed and nowadays 'Big Bang' is no more a pejorative term but popular name of the standard cosmological model, strongly supported by diverse and affluent observational data. As we know, according to it,

the Universe is not eternal but has a beginning in time (~14 Gyr), from an ultracompact, very hot state whose preconditions are still beyond the capabilities of the established physical theories. Moreover, Stephen Hawking, Rodger Penrose and George Ellis extended the equations of General Relativity to include space and time (the so-called Penrose-Hawking singularity theorem) which led to the suggestion that time itself should have a beginning, from the initial cosmic singularity. Various attempts to avoid this conclusion — e.g. scenarios with many universes ('multiverse scenarios') or quantum vacuum fluctuations — in fact postulate entities which are not observable and even not deducible from other principles.[16] It seems that the issue of the beginning of time will remain forever out of reach of empirical or theoretical resolution. Thus a theistic and an atheistic view on the problem *are epistemologically leveled*; both cannot present scientific proofs in their support. However, our increasing knowledge of nature shows a clear trend: it suggests that every part or aspect of the physical reality, at each spatial scale, does have a beginning. This is true of individual men and women, of the species *Homo Sapiens*, of our planet, of our Sun, of the very matter which constitutes living and non-living entities and, finally, of space and time. Even if one speculates that our Universe has a predecessor, some mystical Father-Universe, it seems hard to believe that it is eternal; the entire history of scientific discoveries points towards the opposite.[17] So, there are good scientific reasons to believe that *physical reality is not eternal*. It is ontologically contingent, i.e. it needs a cause, a ground for its existence. Only the 'One Who is' can be the permanently present cause of so many present beings, in a universe, which is contingent, together with space and time.

Without going into details, it suffices to say that this overall picture is consistent with the Biblical account and the Christian doctrine of creation *ex nihilo* (Gen. 1:1, Rom 4:17, Col 1:16, Rev 4:11). Two NT passages also suggest, that time was created together with the world referring to God's deeds and promises 'before times of ages' (*πρὸ χρόνων αἰωνίων*; 2 Tim. 1:9, Tit 1:2). Interestingly, this is in contrast with the

[16] Stephen Hawking, *Brief History of Time: From the Big Bang to the Black Holes*, (New York: Bantam Books, 1988), 136.

[17] Stephen M. Barr, *Modern Physics and Ancient Faith*, (Notre Dam, Indiana: University of Notre Dam Press, 2003), 58-64 (Ch. 8).

concept of Newton which gave the framework of classical physics altogether — according to Newton, God created originally space and time, 'setting the stage' for creation of nature. The relativistic framework in which space-time is intertwined with matter is more consistent with Christian thought. But again, I am not speaking here about consistency with some 'Biblical model of creation' but rather about a *conceptual agreement*.

The standard cosmological model and its implications contribute without doubt to the enrichment of contemporary theological reflections. The emergence of the cosmos and the consequent unfolding of space, time and — in the Grand-Unification theories (GUTs) — of the physical laws themselves, may add valuable insights to the concept of God's thoughts ('ideas') and acts ('energies') immanent in the created world. Also, the enormous spatial and temporal scales of the Universe discloses a deeper level of understanding of the Scriptural claim that 'the heavens declare the glory of God' (Ps. 19:1). One should not expect that the Universe is commensurable with human scales if its purpose is to reveal the greatness of its Creator. On the other hand, it has been planned to provide a home for living creatures and humanity — which provides a link to another argument from modern cosmology.

3.2 The 'anthropic coincidences'

The Big Bang cosmology revived the cosmological argument for the existence of God. About the same time, the teleological argument got a new momentum by the formulation of the so-called `Anthropic Principle' by Brandon Carter[18] and its thorough presentation in the seminal book by Barrow and Tipler published a decade later.[19] The first objection raised against this principle in the scientific community was motivated by the concern that the import of teleology would undermine the scientific investigation itself. However, the study of 'anthropic coincidences' have been performed by many brilliant scientists and most of them are not theists at all. At the roots of each investigation, including the scientific

[18] Brandon Carter, Large Number Coincidences and the Anthropic Principle in Cosmology, *International Astronomical Union Symposium* 63 (1974): 291-298.

[19] John D. Barrow, Frank J. Tipler, *The Anthropic Cosmological Principle*, (Oxford, UK: Oxford University Press, 1986).

one, lays the 'wonder about this wonderful world' (Socrates) and this wonder must not be stilled because of fears of the return of teleology. The possible misuse of teleology should not prevent the careful study of these 'anthropic coincidences', taking into account their large number. Other early claims that the anthropic principle should be reduced to mere 'coincidences' have been inadequate. For instance, the search for conventional explanations of the anthropic coincidences as arising from some fundamental physical theory cannot avoid the very impression of coincidence. As St. Barr puts it: "If [the existence of] life requires dozens of delicate relationships to be satisfied, and a certain physical theory also requires dozens of delicate relationships to be satisfied, and they turn out to be the very same relationships, that would be a fantastic coincidence".[20]

Of course, one can still insist that a mere coincidence has happened. But again, like in the problem with the beginning of time, there is no evidence for such claim and thus its metaphysical nature is unmasked; it is no longer purely scientific. The proponents of such a view have to admit that the Universe has the appearance of having been designed so that humanity appears at some point in its history. (Dawkins, for example, has expressed this practically with the same words in regard to living organisms.[21]) Those who firmly believe that 'science can ultimately give answers to all possible questions' continue to look for natural explanations. A new hope for them came from the above-mentioned multiverse scenarios or a subgroup of them, multi-domain scenarios. In the former case one supposes the existence of a multitude (actually, a continuum) of space-times or universes which are not causally related and characterised by different sets of cosmological parameters while in the latter case there is only one space-time in which there many expanding domains with various physical characteristics existing.[22] Both frameworks seems to offer a purely naturalistic explanation why we live in a universe with so many 'anthropic coincidences' — it is suggested to be a result of huge statistics, i.e., although the possibility is very small, the continuum of universes/domains does still make

[20] Barr, *Modern Physics and Ancient Faith*, 138-148.
[21] Richard Dawkins, *The Blind Watchmaker*, (New York: Norton & Company Inc, 1986), 1.
[22] George Ellis, Multiverses: description, uniqueness and testing, in *Universe or Multiverse?*, ed. Bernard Carr, (Cambridge, UK: Cambridge University Press, 2007).

it different from zero. Then our 'anthropic universe' might not be a special place designed to harbour life and conscience but simply one of the huge number of existing worlds. However, a closer examination of such arguments shows that they are not able to refute the theistic claim about a fine-tuned universe. Even if a fine tuning can be avoided at the level of our universe/domain, this tuning is simply raised at a higher level. Indeed, a universe which produces multiple domains is a very special sort of universe. It is provided with laws that can give rise to existence of domains of sufficiently rich variety so that life could be possible in at least one of them. In this case, this itself is an additional anthropic coincidence.[23]

The multiverse scenario is even more problematic from a philosophical perspective. First, instead of seeking for an explanation of a single universe, it postulates a continuum of universes whose existence does not need an explanation. In fact, it claims that all conceivable and logically consistent universes do exist while habitable universes (like our own) exist like one of the possibilities. This statement is equivalent to removal of the distinction between possible and real — *anything which is possible is actualised*. Second, the multiverse scenario cannot provide an explanation of the orderliness of nature and lawfulness of our Universe, its obedience to a set of neat and orderly mathematical rules. If the scenario is true than one can expect that our Universe is an exception among the exceptions: it allows for life and consciousness and, independently, it is highly structured and ordered. The inescapable conclusion is that someone made a choice out of all possible worlds. And the issue of choice made so that life and consciousness can be possible raises further worldview questions concerning the purpose of such a choice and, further, concerning the meaning of life in cosmological perspective. Instead of providing ultimate answers to questions people have asked in the pre-scientific age, the modern cosmology raises even deeper worldview questions which can find satisfying answers from a theistic and, in particular, Christian point of view. This stresses the importance of a task which I deem to be one of the tasks of scientific apologetics *par excellence*: to offer an evaluation of scientific proposals and theories in terms of their philosophical consequences.

[23] Barr, *Modern Physics and Ancient Faith*, 149-157.

To sum up, the 'anthropic coincidences' and their studies open many opportunities to enrich and deepen theological reflections on God's purposes in creation and even, I dare to say, for the salvation of humanity. For instance, humanity appeared at the 'right time' in the history of the Universe to get 'optimal view of the extent and splendor of God's creation'.[24]

4 Nature of science and history of science itself: prospects for scientific apologetics

Basically, the Christian message to the world is about healing, in the deepest sense of the restoration of the wholeness of the created world. Applied to science, this can, and should, include healing of science from misunderstandings which attribute to it quasi-religious significance and/or view it as a substitute of religion. As said earlier, it is necessary to deconstruct the 'science vs. religion' narrative inherited from the Enlightenment. But there are other, even more important aspects which concern the very nature of science, its methodology and its deep relationships with Christian theology throughout the centuries.

4.1 Science as divinely sanctioned enterprise

From the Christian theological perspective, the impetus to study the world and develop science and technologies is part of the cultural and governing capability of man — the divine sanction is pronounced upon humanity since its creation (Gen. 1:27,28). Moreover, to 'cultivate and subdue the earth' is not only a capability; it is a duty to our Creator and thus He expects that science will emerge and evolve in the course of human history and blesses this development. But science — like all other human activities — is not an end in itself; although it should contribute to the understanding of the world and its cultivation, its pristine goal is to reveal the glory of God. This glory should become more and more visible, both in the universe which we strive to understand and in the personality of every human being unfolded and enriched through science. I would stress especially the latter: to *do science and*

[24] Hugh Ross, *The Creator and the Cosmos*, (Colorado Springs, Colorado: Navpress, 1993), 56.

even interact with it is a part of the complex process of our growth to mature personalities, created in the image of God. Science is a non-abolishable part of the quest of ourselves, in each epoch, at each stage of the development of science and technologies. Therefore scientific enterprise permanently raises worldview questions and philosophical issues and cannot be separated from them. Such a separation (so typical for our century) was foreign to the fathers of science in the last two pre-Enlightenment centuries — not because they still lived in an age of domination of religion but because their striving to understand nature was inseparable from the longing for understanding of the Creator or, at least, for a clear answer whether He does exist. Although they developed methodological naturalism, with its *ad hoc* separation between subject and object of scientific investigation, their mind was not naturalistically shaped. Actually this was the case even after the Enlightenment, though often hidden. Science has never been a simple product of a process of data accumulation which — supported by some useful hypotheses — eventually leads to successful theories. Indeed, any results from observations or experiments involve a complex network of interpretations, expectations, preconceptions; at least some of them are of a philosophical or religious nature. In the words of the philosopher of science Russel Hanson all scientific observations are 'theory-laden'; we see through 'the spectacles behind the eyes'.[25] Matters of taste, judgments of elegance and economy play an important part in the development of science; considerations of beauty and symmetry are crucial in theoretical thought.[26] All these aspects belong to the worldview of the individual scientist and they affect the way he poses his questions to nature. The restoration of this 'holistic' picture of scientists as philosophers of nature and as philosophers in dialogue with nature is important in our age. It is a key to a holistic perception of the entire cosmos. And again, it is more than consistent with the Biblical view of man.

[25] Norwood Hanson, *Perception and Discovery. An Introduction to Scientific Inquiry*, (Berlin: Springer, 2018), 115-129.

[26] John Polkinghorne, *One World: the interaction of science and theology*, 1986, SPCK, Ch. 2.

4.2 Modern science in the context of medieval Christian culture

Indeed, history of science demonstrates clearly that theological reflections on the Biblical doctrines of man, creation and God's purposes have been the fertile medium for the emergence of science. In particular, the formation of science in the modern sense of the term cannot be explained apart from the medieval Christian culture and the century-long efforts to elaborate a Christian philosophy of nature. A wonderful illustration is the history of universities in Western Europe which became prototypes of the modern scientific and academic institutions. Here are some main aspects of the process[27]:

a) Monasteries and monks of particular religious orders catalysed the birth of the new academic communities providing teaching and library resources. As early as in the twelfth century the first cathedral schools were founded and the subsequent rise of medieval cities led to the *formation of guilds of experts (universitas)*. The latter were initially active in a local cathedral school but soon became quasi-independent communities sanctioned only by the church authorities. Many emerging universities acquired special privileges from kings or feudal lords.

b) The cathedral schools offered education according to a programme of the seven 'liberal arts' (*ars liberales*) – it provided the pattern for the academic curriculum in the universities elaborated in the next centuries.

c) The larger universities have been a dynamic medium for discussions. The disputations became increasingly important and contributed to the development of the scholastic thought. For instance, the seminal work of St. Thomas Aquinas *Summa theologiae* is a model for clever disputation with replies to the raised objections and not a set of tenets of the Christian faith.

d) Last but not least, one could find in the medieval university communities a prototype of what is called nowadays "scientific network". The *universitas* (the students and sometimes the professors) were moving bodies. Well-known is the phenomenon of the wandering scholars (*goliardi*) who gave lectures in different places. Thus the emerging academic communities in Western Europe established communications between each other. Some favorable circumstances for the emerging of

[27] David Boorstin, *The Seekers. The Story of Man's Continuing Quest to Understand the World*, (New York: Vintage Books, 1999), 97-109.

these networks were the lack of university administrations and border control and the general acceptance of Latin as international scholar language.

So one cannot but agree with the historian D. Boorstin in his claim: "Our university, like the Church, is a legacy of the Middle Ages, and few modern institutions have so clear a genealogy."[28]

Thus a valuable approach for a contemporary Christian apologetist is to elucidate the common historical roots of science and theology in the prescientific era.

Conclusion

Christians in the twenty-first century should neither develop apologetics 'against' scientific advances, nor elaborate approaches for 'scientific proofs' of Biblical doctrines. Sincere and in-depth interest in achievements in science, without ideological prejudice, is of crucial importance and may provide fruitful ideas as to how to address the philosophical issues generated by them. In particular, contemporary cosmology cannot avoid the main worldview questions but instead gives a new impulse to them, pointing to a richer and wider understanding of God's plan and provision for the Universe and for our planet.

Each discussion on worldview questions raised by recent scientific findings and theories works for the benefit of Christian apologetics — especially in the context of the post-postmodern world with its 'pragmatic' orientation and general suspiciousness towards philosophical/ideological narratives. The simple revival of such discussions would legitimise Christian explanations as meaningful and making sense. The goal of a Christian apologist is to show that these explanations are the 'more probable hypothesis' (Bishop Butler).

In conclusion, I would join the late J. Polkinghorne in his call for the revival of a 'new style natural theology' — which seeks insight rather than logical demonstration and which sees theology not as a rival to science but as a discipline that complements natural sciences in a search for understanding of the physical world.[29]

[28] Ibid, 97.

[29] John Polkinghorne, Contemporary interactions between science and theology, *Modern Believing* 36 (1995), No. 4: 33-38.

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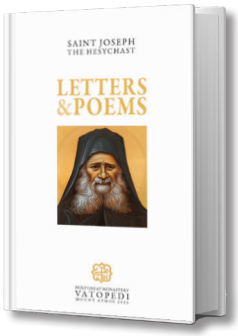

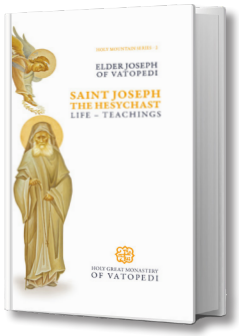

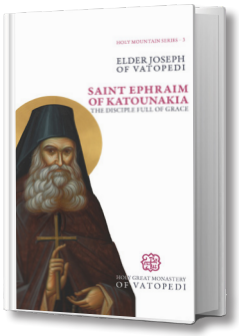

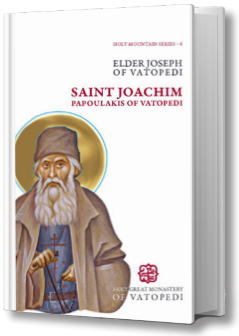

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