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Analogia

Science and Orthodox Theology

"For since the creation of the world God's invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made, so that people are without excuse."

(Romans 1:20, NIV)

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NOTE
FROM THE SENIOR EDITOR

The modern dialectic juxtaposition between Science and Theology did not exist in the Ancient Greek thought. Anyone who reads the books A, Γ, and E of Aristotle's *Metaphysics* becomes aware of the fact that Theology is simply the peak of the obelisk of the *theoretical philosophies*, which obelisk consists precisely in *Mathematics*, *Physics*, and *Theology*. This is the *First Philosophy*, that means, the *Metaphysics*, which investigates the question of being *as it is* – and thus it is a science initially 'possessed by God himself'. The philosophical systems of the Epicureans and, even more, the Stoics, based their ethics and anthropology upon science and the vision of a holistic knowledge of the universe, where ethics, logic, and physics are one and the same *animal* or *egg* or *fertile field*, according to Diogenes Laertius (7, 40).

The myth, according to Peter Harrison, of the conflict between science and religion/theology began in the recent centuries, and only after the Protestant criticism of the frozen medieval Roman Catholic understanding of the universe. According to Harrison, the literal approach to the Scripture, made by the Protestants, initiated fundamental changes, which led to the creation of modern science. First, it precipitated the collapse of the symbolic universe of the medieval ages, and made possible the creation of experimental physics, in close alliance with natural theology. Second, the literal understanding of the Biblical doctrine of the Fall, concluded with the arousal of scientific activity, which aimed at restoring nature and extending human domination upon it. Of course, the parallel rise of the modern *exclusive humanism*, in Charles Taylor's terms, gradually secularised this sort of scientific approach of the *Cosmos*. Thus, by the end of 19th century, even Christianity itself was considered as a series of statements needing an experimental 'scientific' proof. In this way, modern science reversed the Aristotelian obelisk, and finally abolished its ancient peak: for a considerable part of modern philosophy, Metaphysics seems to mean only an investigation of the clarity of scientific proposals.

However, post-modern thought allowed the emergence of the question of Metaphysics again. This also makes possible a rethinking of the science-theology relation in a new light. The aim of this volume is precisely to shed a glimpse of this new light upon this ongoing conversation, by now involving Orthodox Theology in it. The possible contribution of Orthodox Theology to this discussion, in the context of the Christian Greek-Western world, can be path-breaking.

I thank all the contributors to this valuable project, and especially Prof. Stoyan Tanev, who, under his double capacity as scientist and theologian, undertook the difficult enterprise of putting together this insightful volume.

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

EDITORIAL

The thematic focus of this special issue is broadly defined as 'theology and science'. The breadth of the thematic focus is part of the initial design of the special issue and could explain the variety of topics addressed by the contributors, who were invited based on their ability to contribute a unique, insightful, and engaging perspective on the productive encounter between theology and science. It should be admitted however that some of the contributions could be better positioned on the interface of science and religion (and not so much theology). This could be also considered as part of the initial editorial design which focused mainly on ensuring the interdisciplinary nature and quality of the of the specific insights.

Despite the variety of the topics, one could identify (in addition to the other distinctive topical contributions) two more dominant themes focusing on issues related to the dialogue between theology and quantum physics, and theology and psychology. The more substantial presence of these themes reminds of a point made by Christos Yannaras for whom the post-modern duty of the Church consists in the creative appropriation of the new language emerging quantum mechanics and post-Freudian psychology, aiming at linking the salvific message of the Christian Gospel to linguistic categories that could be more efficient in the interpretation of the reality of existence, the appearance and disclosure of being, and more specifically, in the articulation of the existential and empirical mode of the relationship between God, world, and man.[1] These two themes however could only enhance the interdisciplinary value of the rest of topics discussed in the special issue.

For example, Jean-Claude Larchet, a well-known French Patristic scholar, Orthodox theologian and prolific writer, provides a systematic review and analysis of *The Patristic Views on the Nature and Status of Scientific Knowledge*. According to Larchet, even though some of the Fathers admit the possibility of using reason or logical reasoning in the theological domain, the common Patristic view is that science remains limited to a knowledge of appearances only. For Larchet however this view does not seem to contradict the current scientific understanding since science focuses on studying phenomena, i.e. it does not claim that its knowledge coincides with reality as it is in itself, and the deepest essence of things remains inaccessible to the scientific approach. For some of the Fathers true knowledge of the nature of things is that of their *logoi*. Such knowledge becomes possible through the contemplative function (*θεωρία*) of the intellect (*νοῦς*), which presupposes a proper spiritual preparation (*ἄσκησις*). This contemplation seeks to grasp the *logoi*

[1] See Christos Yannaras, "The Reality of the Person in Post-Modernity", in: *The Meaning of Reality – Essays on Existence and Communion, Eros and History* (Los Angeles: Sebastian Press & Indiktos, 2011), 21-28, as well as interview with Yannaras on June 26, 2002 at the Bulgarian Science and Culture Foundation in Sofia, Bulgaria (in Bulgarian): http://svetinikolay-sofia.info/wp-content/uploads/2010/11/www.hkultura.com_db_text_2002_3_4_cristosjanaras.pdf.

of created beings in themselves by disengaging them from their immediate sensible expression, and thus distinguishing in every single being between its logos and its appearances. Natural contemplation discovers God, the incarnate Logos in the logoi of beings, but it also discovers the Spirit that is present in creation. This is how a believer can attain spiritual knowledge while the contemplation of nature is related to the science of beings alone.

Alexei Nesteruk is a Senior Research Lecturer in the School of Mathematics and Physics at the University of Portsmouth, Hampshire, GB, working on foundations of cosmology and quantum physics. He is one of the most proactive Orthodox contributors to the dialogue between science and theology. Nesteruk re-envisions *The Dialogue between Orthodox Theology and Science as Explication of the Human Condition*. He adopts a philosophical perspective in emphasizing that the foundation of both science and theology originates in human beings. Human beings have an ambiguous position in the universe that cannot be explicated on metaphysical grounds but can be interpreted theologically. The difference in the hermeneutics of representation of the world in the phenomenality of objects and the inaugural events of human life and religious experience is a key characteristic of the human condition. This difference is the reason for the paradoxical position of humanity as an object in the world and a subject for the world. It is also the fundamental reason for the split between science and theology. That is why, for Nesteruk, any attempt of overcoming this difference under the guise of a 'dialogue' between science and theology represents an existentially untenable enterprise. The overcoming of the unknowability of man by himself which is attempted through the reconciliation of science and theology, is not ontologically achievable, but demonstrates the possibility of uncovering a definite sense of purpose. In this sense, the dialogue between theology and science can be considered as a teleological activity representing an open-ended hermeneutics of the human condition. For Nesteruk the discourse of the paradox of subjectivity provides the delimiters for any of such hermeneutics.

Georgi Kapriev is Professor of the History of Philosophy at St. Kliment Ohridski University in Sofia, Bulgaria. The area of his research interests is the medieval – Latin and Byzantine – philosophy and culture, as well as the cultural history of the 20th and 21st centuries. Kapriev's works have advanced the study of Byzantine philosophy worldwide. His paper *Actor-Network Theory and Byzantine Philosophy* offers a detailed reflection on almost 20 years of work focusing on the interdisciplinary exploration of the paradigm of Actor-Network-Theory (ANT) through the application of concepts and methods inherent in Byzantine philosophy. Kapriev systematizes and expands some of the latest research in this interdisciplinary domain. The starting point is the attempt to re-examine the sociological explanations of such phenomena as endurance, resistance and innovation, which are difficult to explain through the paradigms of classical sociology. The suggested analysis adopts the concepts of essence-energy-power, hexis, perichoresis, hypostasis, prosopon and body, to

refine some of the positions characteristic of the ANT paradigm, and propose new ones that allow to problematize ANT's principle of symmetry between human and non-human actors, the understating of initiative, the essence and the figure of the actor. The paper pays special attention to some of the paradoxes inherent in the understanding of the human hypostasis and to the questions emerging from the theoretical prescriptions of transhumanism. It is a great example of how the adoption of the conceptual apparatus of Byzantine theology could benefit the social sciences.

Fr. John Breck is an Archpriest and theologian of the Orthodox Church in America specializing in Scripture and Ethics. He has served as Professor of New Testament and Patristics at St. Herman's Orthodox Theological Seminary (Kodiak, Alaska), as Professor of New Testament and Director of Studies at St. Sergius Orthodox Theological Institute (Paris, France), and as Professor of New Testament and Ethics at St. Vladimir's Orthodox Theological Seminary (Crestwood, New York). His paper *Quantum Physics and Christian Faith* is a text adapted from a chapter of his recent book *Beyond These Horizons, Quantum Physics and Christian Faith*, published in 2019 jointly by St. Sebastian Press and Kaloros Press. The book itself is structured as a novel, with lectures given by a young professor of physics to a group of alumni of his university. It lays the groundwork for an exploration of the relationship between quantum mechanics and certain key aspects of the traditional Christian teaching. According to Fr. John Breck quantum theory, if properly interpreted, offers invaluable insights in our quest to see beyond the empirical horizons of the world we live in. "It provides a fresh perspective on the spiritual significance of the Whole, from unimaginably small quantum phenomena to the immense galaxy clusters of an ever-expanding universe." One of the aims of the book is to point out that our usual conceptions of God and the world are simply inadequate. With the help of insights drawn from quantum theory, we can now see that Creation is more intricate, more interconnected and more beautiful than one could ever have imagined. The text included in this special issue demonstrates how a deeper discussion of the peculiarities of quantum physics could be turned into a wonderful journey into the realm of Orthodox theology.

Stoyan Tanev is Associate Professor of Technology Entrepreneurship and Innovation Management in the Sprott School of Business at Carleton University, Ottawa, Canada, and Adjunct Professor in the Faculties of Theology at St Paul University in Ottawa and Sofia University, Bulgaria. He holds a PhD in Physics and a PhD in Theology. His paper *Exploring Analogy of Debates to Approach the Encounter between Orthodox Theology and Quantum Physics* adopts the Analogical Comparative Theological Approach (ACTA) to explore the encounter between Orthodox theology and quantum physics. The ACTA approach integrates the intuitions of the analogical isomorphism and comparative theology methods by focusing on issues that are of high relevance for both theology and physics. The issues addressed here are the ones emerging within the context of two important debates: a) between St Gregory

Palamas and Barlaam the Calabrian in the fourteenth century, and b) between Albert Einstein and Niels Bohr in the twentieth century. The first debate is refers to some of the key aspects of Orthodox theology and spirituality. The second debate is related to the never-ending challenges of the interpretation of quantum mechanics and the nature of physical reality. The analysis suggests that the controversial issues in the two debates are deeply rooted in disagreements about the nature of knowledge, the interplay between epistemological and ontological issues, the challenges of applying logical arguments, the role of apophaticism, the challenges of knowing and the ways these challenges affect the interpretation and sharing of human experience. The discussion of the role of apophaticism is of particular interest since it shows a common need of going beyond representation, assertion and negation by focusing on epistemological conditions of knowledge emerging through union and participation. This need is more sharply expressed in Orthodox theology where the apophatic does not emerge as a comment on representation, but as an opportunity for participation. The paper offers a first theological reflection of the analogical potential of QBism – a recent interpretation of quantum mechanics that takes agent's actions and personal experience as the central concerns of quantum theory. The key message of the paper is that one can learn more about theology and quantum physics by adopting the ACTA exploratory lens to examine the potential similitudes between the ways theologians and physicists debate about their ways of knowing and the challenges of articulating their personal experience with reality.

Tim Labron is Professor of Philosophy and Religious Studies in Concordia University of Edmonton, Alberta, Canada. Labron is a leading scholar working on the theological implications of Ludwig Wittgenstein's philosophy. One of his last books is *Science and Religion in Wittgenstein's Fly Bottle* (Bloomsbury Academic, 2016). His paper is titled *Logic of Mystery: Reading Wittgenstein in Parallel to Orthodox Theology and Quantum Theory*. Labron's starting point is that, in contrast to Western philosophy, theology, and classical physics, Wittgenstein, Orthodox theology, and quantum theory (e.g., Bohr and the Copenhagen interpretation) are more comfortable with mystery and do not have a similar drive to explain, codify and justify knowledge. According to Labron, these three points of view—Wittgenstein, Orthodox theology, and Bohr—are distinct from one another, yet they all converge on the importance of our living experience (participation) in contrast to excessive ratiocination. At the same time, it is obvious that neither Bohr nor Wittgenstein were opposed to scientific investigation, nor by any stretch of the imagination were they Christian apologists. Yet they both showed the confusion of conflating or reducing reality and meaning to metaphysical or logical confines only. Labron's point is that mystery is a given and in a theological context it is experienced as a personal relationship. The example provided by Labron refers to the liturgy – mystery is part of the liturgy, but it is not a cognitive metaphysical mystery. It is exactly because mystery is part of the liturgy, it is concretely lived by the believers.

Georgios Gounaris is Professor Emeritus in the Department of Theoretical Physics, Aristotle's University of Thessaloniki. His paper *The Cosmos in the Bible and Science* presents the Biblical description of the Creation of the Cosmos in parallel with the corresponding description of contemporary science. The scientific understanding of Creation presented in the paper is based on the assumption that the forces of Nature were created at the very beginning and have remained unchanged ever since. First, without this assumption, it is impossible to shape a creation story. Second, the few available measurements so far agree with this assumption. Gounaris switches masterfully between the biblical and scientific narratives to offer a story which is both very readable and highly insightful.

Fr. Nikolaos Loudovikos is one of the leading Orthodox theologians today who has an interdisciplinary background in theology, philosophy and psychology. He is a Professor of Dogmatics and Philosophy at the University Ecclesiastical Academy of Thessaloniki (Greece), Visiting Professor at the University Balamand (Lebanon), the Institute for Orthodox Christian Studies (Cambridge, UK), and Research Fellow at the University of Winchester in the United Kingdom. Loudovikos' paper *Psychoanalysis and Eschatology* provides an insightful discussion of the relationship between psychoanalysis and theology. According to Fr. Nikolaos, at the deeper level of ontological presuppositions and consequences, psychoanalysis has yet to receive a proper theological treatment or be given a sufficient and sober interpretation. He engages in a discussion of several philosophical critiques as a path towards a theological hermeneutical encounter. Loudovikos selected three of the most important philosophical critics of psychoanalysis in the twentieth century: L. Wittgenstein, P. Ricoeur, and C. Castoriadis, because of the complementarity of their critiques and their suitability for a potential theological hermeneutical engagement. After discussing their views, Loudovikos asks the question: In what way, then, does psychoanalysis differ from theology? The answer he provides is provocative: "psychoanalysis seems to be at its base a former philosophy that wishes to become a theology, and herein lies its fundamental 'scientific character'". According to Fr. Nikolaos, it is the 'theological' nostalgia for empirical authenticity that provides psychoanalysis with the quality of an empirical science. The paper offers an insightful story that could benefit many scholars interested in the interface of psychology, philosophy and theology.

In his second paper *Theology and the Discovery of the Unconscious: Preliminary Remarks*, Fr. N. Loudovikos provides a theological account of the Unconscious by reviewing some of the most relevant research studies in the domain, and then making several theological remarks as a basis for future studies. He reviews the contributions of three books: Matt Ffytche's *The Foundation of the Unconscious: Schelling, Freud, and the Birth of the Modern Psyche*; Suzanne Kirschner's *The Religious and Romantic Origins of Psychoanalysis: Individuation and Integration in Post-Freudian Theory*; Michel Henry's emblematic Généalogie de la Psychanalyse: Le Commençement

Perdu. The combination of the three books forms a highly representative source for the research of the Western history of the Unconscious. Loudovikos guides the reader through the insights articulated in these works and ends his analysis by articulating several preliminary remarks. *First*, for him, the Unconscious seems to relate with the truth and the fullness of human nature and life, but the relation is impossible without its grounding in appropriate theological premises such as freedom and autonomy, holism, catholicity, particularity, originality. *Second*, the Unconscious has to do with human desire and will, and therefore with ecstasis, which means that the discernment of similarities and differences concerning its possible meaning requires a history of ecstasis in both East and West. A possible theological interpretation of the Unconscious could find its basis in St Maximus the Confessor's understanding of the natural will, who can be considered as a forerunner of the modern notion of the Unconscious. *Third*, the Unconscious is apophatic; it is radically unknowable but pretends to possess an absolute knowledge concerning the essence of human nature. To reconcile the bipolarity of unknowability and knowledge in the Unconscious one should find a true analogical dimension that could relate the divine fullness and human inwardness. Loudovikos suggests that his previous work on the analogical identity of man could become a basis for further exploration of this point. *Fourth*, the Unconscious is wise because it goes beyond representation but also because it reflects primordial human nature and life. Because of that it can be related with the image of God in man. *Fifth*, the Unconscious is revealing because it discloses hidden aspects of the divine image. *Lastly*, because of its revealing role, the Unconscious is also eschatological, in the sense that in its theological and psychological interpretations it pertains to the final fulfillment of human nature. According to Loudovikos, it will be impossible to explore the notion of the Unconscious in its fullness unless one examines further the relation and the difference between the ancient philosophical and Patristic concepts of life, nature, person, and ecstasis.

Athanasios Fokas is a mathematician, with degrees in Aeronautical Engineering and Medicine. He is Professor of Nonlinear Mathematical Science in the Department of Applied Mathematics and Theoretical Physics (DAMTP) at the University of Cambridge. His paper is the Prologue of his forthcoming book *Ways of Comprehending* (World Scientific, 2022). In this book Fokas suggests a unifying approach to life that is based on the elucidation of deep neuronal mechanisms, which ultimately lead to understanding and fulfilment. The book is an exemplary work of interdisciplinarity. Some of its key features are as follows: (i) it suggests a way for resolving the paradox between the abundance of information and specialization; (ii) it introduces an all-encompassing approach to the sciences and humanities that will help restoring the arts and letters to their rightful position at the centre of the human existence; (iii) it demonstrates that a unified, integrative approach to knowledge is indeed possible by refuting the myth that it is supposedly impossible to be both deep and broad (for the author breadth and depth are not antithetical but act synergistically); (iv) it provides

the proper framework for an illuminating discussion of several important questions which should concern every educated individual: "What is the origin of the distinguishing mental advantages of humans in comparison to our evolutionary predecessors? What is the relationship between innate and acquired knowledge? What does it mean to 'understand' and how is insight achieved? Why is it possible for us to comprehend the universe? What is the effect of the cultural evolution on our brains? What is the neuronal origin of our emotional responses to arts and letters?" The paper will provide a sense of how the answers to these questions should incorporate elements of biology, neuroscience, medicine, mathematics and physics.

Gayle E. Woloschak is a Professor of Radiation Oncology at Northwestern University in Chicago and Associate Director for the Zygon Center for Religion and Science at the Lutheran School of Theology Chicago. She holds a PhD in Medical Sciences and DMin in Eastern Christian Studies. Woloschak's paper *Evolution, Genetics, and Nature: Implications for Orthodox* provides a medical scientist's perspective on evolution. It does not engage in the usual for the science and religion community apologetics of evolution — i.e., defending evolution against creationism or intelligent design or some other form of fundamentalist perspective on human origins. It attempts to discuss evolution from the perspective of the implications it has for how we think about humanity now and in the future. Unavoidably, the suggested perspective has a naturalistic flavour which refers to life as 'that which evolves' and defines evolution as a process by which natural selection chooses those species that are most fit to survive in their current environment. Evolution is driven by random mutations. According to Woloschak the randomness of mutations is essential for evolution because without randomness species would not be able to adapt to a changing environment and the Earth could not sustain life. She admits that many in the Church find it worrisome that randomness plays such an important role in creation. Randomness however allows for a creative and dynamic component in the process of creation and is essential not only for the evolution of species but also for the survival of each living organism. The concept of natural selection suggests that nature selects for an organism what is best suited for a particular environment, which does not mean that this is the best possible design that one could develop or the best organism that lives in an environment. Evolution, because of its randomness, is not perfect. Life is not perfect, and many aspects of humanity are not well-suited to the lives we live. But in all cases our biological existence is the result of our species' evolution so far. Woloschak raises two questions: How much humanity should be revering our evolution and calling those biological traits that have been most successful so far 'natural'? Should we morally forbid anything that appears to be 'unnatural' today simply because it was not (yet) selected for by evolution? The paper discusses the possible answers to these questions in the context of the Church and provides a reflection on their implications for the emerging ethical perspectives on 'un-natural acts' such as in vitro fertilization (IVF), genome editing, vaccines,

and other medical technologies. The final recommendation of Gayle Woloschak is that people in the Church should remember two important aspects of evolution. "First — we are all members of our species and a new disease without a vaccine or swift climate change may quickly change the odds for survival of those of us who are currently in majority. Secondly — we recognize as 'natural' simply that which is currently most prevalent in our species because evolution has favored it so far." The paper is quite informative. It opens the possibility for future studies that could focus on the discussion of some important theological issues such as the relation between the evolution and the human Fall, as well as the relation between the characteristics of the Divinely created human nature, its imperfections from the point of view of evolution, and the understanding of the 'natural' which seems to emerge somewhat a-theologically, i.e. predominantly in the context of contemporary medical professional practice.

We hope that the specific topics and interdisciplinary perspectives adopted by the contributors to this special issue will both enable, motivate and demonstrate the need for future studies that could help in shaping the answers to some important questions. What does make the dialogue between science and religion theologically valuable? What are the best modes of engaging theology and science in a way that could enable their synergetic impact on each other? How can we transform our academic endeavours on the interface of theology and science into a source of prayer, hope, compassion, and love towards the Other? How to use the dialogue between theology and science as an invitation for the participatory engagement and theological opening of people who are outside of the Church?

– ***Stoyan Tanev***, Guest Editor

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Patristic Views On The Nature And Status Of Scientific Knowledge

JEAN-CLAUDE LARCHET
Patristic scholar and theologian, France

The Fathers have a variable approach to science. Science is often respected in its own method and in the knowledge that comes from it. Medical science, for example, was recognized very early in its autonomy. A Father like St Gregory of Nyssa, in the fourth century, had no difficulty in recognizing Hippocratic-Galenic medicine despite its pagan origin. For his part, St Gregory Palamas, in the fourteenth century, does not hesitate to affirm: 'In matters of physiology, there is no dogma', a liberal position, but only in appearance, because there is in the background the idea that scientific knowledge is relative and should be relativized as a mode of knowledge. If some Fathers admit the possibility, up to a certain point, of the use of reason (St Maximus the Confessor) or of logical reasoning (St Gregory Palamas) in the theological field, it is however commonly accepted that science remains limited to a knowledge of appearances only. This does not contradict the conception that current science has. On one hand, it defines itself as the study of phenomena (*τα φαινόμενα*, that is to say what appears to the senses or to the instruments of observation and measurement) and of their laws. On the other hand, the neo-Kantian conception of modern science, considers that the scientist knows reality only as it appears to him or her and as he or she theorizes it by reason. Then, science is not able to claim that knowledge, always relative, coincides with reality as it is in itself, the essence of being remaining forever inaccessible to this type of approach. From this point of view, some Fathers stress that the true knowledge of the nature of things is that of their *logoi* (St Maximus the Confessor), which is only possible by the intellect (*νοῦς*) in its contemplative function (*θεωρία*), which presupposes a whole spiritual preparation (*ἄσκησις*). Compared to this form of superior knowledge, scientific-type knowledge is, in the eyes of some Fathers (Isaac the Syrian) only a degenerate form of knowledge, implemented by fallen man as an ersatz to true spiritual knowledge, which he has lost and cannot easily recover.

Introduction: Some remarks on methodology

The subject I have chosen to deal with brings up some methodological problems that need to be examined.

The first problem has to do with the idea of 'scientific knowledge' and therefore of 'science' itself. In this presentation, we understand the word *science, a priori,* in its modern, ordinary sense, that is, the commonly accepted definition: 'knowledge of phenomena and their laws', a rational, rigorous, coherent knowledge that, from the methodological point of view, implies in principle three stages: 1) observation, 2)

formation of a hypothesis, and 3) verification of the hypothesis which in the case of the first and third stages can take various forms both direct and indirect.

The modern idea of science did not exist in the Fathers, designated by that word. The Fathers designated what corresponds to it rather as a certain kind of knowledge that uses the senses and reason and that deals with the realm of nature considered in its appearances.

A second problem consists in the fact that the areas of knowledge that today belong to the sciences in the past took forms that we can call, using contemporary norms, non-scientific. On the one hand, physics, astronomy, physiology, for example, belonged for a long time to philosophy (this was the case in the West at the time of Descartes, that is, in the seventeenth century), and we know that until the nineteenth century, chemistry was still closely related to alchemy, itself a mix of philosophical, religious, and esoteric theories. On the other hand, some subjects that we consider to be sciences today were in the past thought of as 'arts', that is as technical skills. The best example of this is medicine, certainly still today considered to be an art, but which has also developed as a science that is the basis of this art.

Science, as we conceive of it today, only came about at the end of the nineteenth century, and so we need to watch out for anachronisms and be vigilant about the use of concepts.

A third problem is found in the difficulty of defining a single, global approach of the Fathers in relation to what we today call science. On the one hand, there are various opinions and positions that must be taken into account, but on the other, these opinions are only insights.

In this presentation, we will refer especially to the insights that are found in four Fathers who belong to different periods and outlooks: Clement of Alexandria (second to third centuries), St Maximus the Confessor (seventh century), St Isaac the Syrian (seventh century) and St Gregory Palamas (fourteenth century).

1. Tolerance with regard to 'scientific' knowledge and its diversity

From a certain point of view, the Fathers recognized the independence of scientific knowledge, and for this reason, they are tolerant of the diverse theories worked out by it.

In my book, *The Theology of Illness*, I showed that the Fathers of the first centuries accepted the theories about medicine that were dominant in their time.[1] Starting with the third century, we can consider that the diagnostic and therapeutic methods of Galenic medicine had become dominant in the whole Christian world.[2] When they spoke about physiology and medicine of the body, the Fathers normally used the Hippocratic and Galenic categories. This is the case especially with St Basil of

[1] *Théologie de la maladie*, 3e éd. (Paris, 2001), 101–109.
[2] P. Lain Entralgo, *Maladie et culpabilité* (Paris, 1970), 93–94.

Ancyra, St Gregory of Nyssa, St Basil of Caesarea or Theodoret of Cyrus.[3] These categories were adopted afterwards by Byzantine medicine, which developed on them as their foundation[4].

These medical theories were dominant at the time, and this explains their unanimous acceptance. But in other areas, or at other times, the theories were quite diverse. In the area of physiology and astronomy, St Gregory Palamas (fourteenth century) recognized the legitimacy of many hypotheses, all of them credible. He justified this by the fact that knowledge of reality itself is not naturally open to us and belongs to God alone:

> On such subjects, if we ask how the mind is attached to the body, where the seat of imagination and opinion is, where the memory is located, which part of the body is the most vulnerable and, so to speak, directs the others, what the origin of blood is, whether each of the humors is free from any mixture, and which internal organ contains which humor, in such matters, all can give their opinions since everything that can be said in this area is reasonable. The same thing holds for the constellations and the movement of the stars, for the grandeur and nature of each one of them, as well as for all questions of this sort about which the Spirit has not given us any clear revelation, for only the Spirit knows exactly the Truth that penetrates every thing.[5]

We could relate this conception to Kant's when he said 'the thing in itself' is not accessible to us—a theory that modern science, which is generally based on Neokantian epistemology, has taken up. However, the difference is that St Gregory Palamas considered it possible to know reality in itself, but this only belongs to God and to those to whom he wants to reveal it.

This position is liberal, but only in appearance, for, as we will see, there is an idea in the background that says that scientific knowledge is relative and therefore must be relativized as a mode of knowing in relation to another form of knowledge, which is spiritual knowledge.

[3] Among others, see: Basil of Ancyra, *On Virginity*, IX; XII; Gregory of Nyssa, *Treatise on Virginity*, XXII, 1–2 ; *The Creation of Man*, I; XII; XIII; XXX; *Homilies on the Our Father*, IV, 2; Basil of Cesarea, *Hexaemeron*, V, 4; 5; 8; Theodoret of Cyrus, *History of the Monks of Syria*, XVII, 5; 8; *The Therapy of hellenic deceases*, V, 82; *Discourse on Providence*, III; IV; VI.

[4] The great Byzantine doctors, Oribase (fourth century), James the Psychestre (fifth century), Caelius Aurelianus (fifth century), Aetius of Amida (sixth century), Alexander of Tralles (sixth to seventh century), Paul of Egina (seventh century), Theophile Protospatharios (seventh century), Theophanes Nonnos (tenth century), and Michael Psellos (eleventh century) are known as encyclopediasts and compilers of the dominant Galenic tradition. Cf. F. Brunet, 'Les médecins grecs depuis la mort de Galien jusqu'à la fin de l'Empire d'Orient', in M. Laignel-Lavastine (éd.), *Histoire générale de la médecine* (Paris, 1936), t. I, 433–63.

[5] *Triads in Defense of the Holy Hesychasts*, II, 2, 30.

2. A pragmatic notion of science

The Fathers who accepted the medical theories of their time or the diversity and relativity of scientific knowledge had a very pragmatic conception of such knowledge. This pragmatic conception concerned first of all the goal that these sciences pursued or the goal their application attained. The essential point was this: medicine should care for the sick and heal; other scientific knowledge should serve the general good. In fact, what made them good and valuable was the use they were put to. This point of view was developed by St Gregory Palamas who, like St Isaac the Syrian,[6] who developed the idea before him, related scientific knowledge to the tree of the knowledge of good and evil mentioned in Genesis 2:17:

> The exact knowledge of the celestial spheres, their movement and symmetry, as well as their properties, this is also a knowledge of good and evil, for it does not possess goodness in its very nature, but in the intention of those who use it. It changes with the intention of those who use it, going one way or another. All the more reason, I would also say… that the discoveries of nature's mysteries, the various methods of logic, the different opinions about the science of calculating, the various ways of measuring immaterial configurations, all these things are at the same time good and evil not just because they appear so according to the thinking of those who use them [but also because] they easily take the form given to them by the point of view of those who possess them.[7]

We do not have to agree with this position, especially as it relates to what are called today the fundamental sciences since they have as their aim, according to the classical definition, to attain to 'knowledge for itself' and do not have any *a priori* application, foreseeable or possible. Obviously, however, the question is relevant when dealing with the applied sciences and, all the more so, the arts (in the ancient sense), in other words, the technical applications they are related to.

The pragmatic conception of the Fathers that justifies their tolerance has secondly to do with the person engaged in scientific knowledge: the usefulness of the sciences is then, according to St Gregory Palamas, to educate and form the mind of the one who practices them.[8]

3. The danger of losing oneself in scientific knowledge and thus of not participating in any activity or in any superior knowledge

[6] *Ascetical Homilies*, 63.
[7] *Triads in Defense of the Holy Hesychasts*, I, 1, 6.
[8] *Ibid*.

St Gregory Palamas adds that, once this education is finished, it is proper to leave the sciences behind and to give oneself over to a superior activity:

> Their study is only a good thing to the extent that such study develops in the eye of the soul a piercing look. But it is a bad thing for whoever gives himself over completely to this study and to stay with it even into old age. The good solution is to train yourself a little, and then to give oneself over to what is much superior and much surer, for despising them carries with it a great reward from God.[9]

Palamas then refers to what St Gregory of Nazianzus said about St Athanasius of Alexandria:

> He had studied the profane sciences just enough to avoid giving the impression of being totally lost, and he was even ignorant in such matters since he had resolved to despise them. In fact, he found it intolerable to occupy his noble and elevated mind with vain studies and to undergo the same fate that some athletes suffer, those who beat the air more than their opponents and thus see the victory slip through their fingers.[10]

He also refers to what St Gregory of Nazianzus thought about himself: 'He himself studied [the sciences] with delight, according to his own words, to the extent that he despised them and possessed Christ whom he preferred to them.[11]'

As St Gregory Palamas underlines, the danger is in fact to give oneself over to science with the consequence of depriving oneself of the spiritual life. Because the universe of unknown and inexplicable facts goes on and on forever and because scientific knowledge progresses and is constantly renewed, the risk is great of letting oneself be dragged into an endless process, both illusory and alienating, and this is quite close to a devilish seduction:

> The Evil One is always trying to maliciously turn us away from what is superior, to engender in us charming things, and to tie us up in them with hardly any chance of getting loose. [He wants to get us] wound up in those attachments so dear to men full of vanity. He suggests to us the deep and multifaceted extent of the sciences, the multitude of knowledge associated with them, as he suggests to other wealth and false glory, and fleshly pleasures,

[9] *Ibid*.

[10] Gregory Palamas, *Triads in Defense of the Holy Hesychasts*, I, 1, 6; Gregory of Nazianzus, *Orations*, XXI, 6 (SC 270, 120).

[11] Gregory Palamas, *Triads in Defense of the Holy Hesychasts*, I, 1, 6; Gregoire of Nazianzus, *Ad Nemesium* (PG 37:1554).

> so that we keep ourselves busy all our life chasing after these things and not having enough strength to firmly undertake the kind of education that purifies the soul [and leads] to the knowledge of the mysteries of God: real and true education and knowledge of which a man given over to the love of vain philosophy, being all wrapped and rolled up in its images and theories does not even see the beginning.[12]

4. The usefulness of reason and its limits

Scientific knowledge is a kind of rational knowledge. Even if intuition and imagination play a role in it, especially in developing hypotheses, they always remain the servants of reason. The rational coherence of a theory is one of the basic conditions for its validity. The development of modern science in the area of the infinitely small has resulted in the fact that today science is less involved in sensible phenomena, tangible and measurable things, than in conceivable things. Theories are no longer explanations of observable phenomena and no longer claim to describe reality but are 'models' constructed by reason that are only required to give a coherent understanding of reality; several different models can, from this point of view, legitimately coexist. Modern science is, by this very fact, not just rational but rationalist, and it can in many ways lay claim to the principle of rationalism: what is real is rational, and what is rational is real.

The Fathers do not deny the value of reason. In his *Apodictic Treatises*, where he opposed Barlaam, St Gregory Palamas defended the value of reasoning and of demonstration, even in theology.[13] And one of Gregory Palamas's disciples, Nil Cabasilas, used a demonstrative method of a rational type, similar to those of the scholastics with whom he debated.[14] Even in spirituality, St Maximus the Confessor underlined the usefulness of reason in searching for God.

Nonetheless, the Fathers did not accept an autonomous exercise of reason and considered as limited and vain the use of reason that was based only on sense data and on its own concepts. Reason, in theology, must have revelation as its base or else be enlightened by the intellect, which receives illumination from grace.

In *Questions to Thalassios*, 59, St Maximus explains that reason is not only useful but indispensable, but that it must be used in relation to the intellect and in synergy with grace:

[12] *Triads in Defense of the Holy Hesychasts*, I, 1, 7.

[13] See Grégoire Palamas, *Traités apodictiques sur la procession du Saint-Esprit*, introduction de J.-C. Larchet, traduction d'E. Ponsoye (Paris, 1995).

[14] See Nil Cabasilas, *Sur le Saint-Esprit*, introduction, texte critique et traduction et notes par le Hiéromoine Théophile Kislas (Paris, 2001).

> It is not legitimate to say that grace alone produces in and of itself in the saints the knowledge of the mysteries without the help of the natural faculties which can open us up to knowledge. … Neither, certainly, is it true that, without the grace of the All-Holy Spirit, can the saints, using only their natural faculty, receive true knowledge of reality. … Thus the grace of the All-Holy Spirit does not produce in the saints either wisdom without the intellect to receive it or knowledge without the faculty of reason capable of receiving it … And the reverse as well is true: man will not acquire [such knowledge] with just his natural faculty, without the divine power which dispenses them.[15]

5. The limits of scientific knowledge

Several Fathers emphasize the limits of scientific knowledge itself. One of these limits has to do with the hypothetical character of its theories and therefore with the fact that such theories are relative and uncertain. Clement of Alexandria underlined this also, opposing faith and science:

> Sense data gives access to science while faith, after having first passed through things open to the senses, then abandons conjecture and hurries on to what does not deceive and stands firm in truth.[16]

Another limit has to do with the fact that scientific knowledge always presupposed that, at its base, there are undemonstrated principles and undefined concepts, as Aristotle showed in his *Posterior Analytics*. Not only is scientific knowledge unable to arrive at an integral rationality, as it claims, but it implies, as Clement of Alexandria underlined, a foreknowledge[17] that is not only derived from sense data (as Epicurus thought in his theory of pre-notions to which Clement referred), but that also constitutes a form of faith. And this form of faith does not have the certainty of the Christian faith, founded on divine revelation.[18]

In the eyes of the Fathers, however, the first limit of science is that it remains a prisoner of the limits of nature.[19] That means that science is only related to the sensible and material world and that it knows nothing of what is outside of and beyond it. It implicitly affirms then that only the sensible and material world exists and tries to relate everything to itself, in fact to reduce everything that exists to itself. Clement of Alexandria quotes Plato:

[15] *Questions to Thalassius*, 59 (CCSG 22, 47–49).
[16] Clement of Alexandria, *Stromata*, II, iv, 13, 3.
[17] *Ibid*., 16, 3.
[18] See *ibid*., 13, 3–18, 3.
[19] St Isaac the Syrian, *Ascetical Homilies*, 62.

> Those who find it hard to believe try to draw down to earth everything that is in heaven and invisible. Being convinced by everything they can understand of the material world, they energetically claim that the only thing that exists is what offers resistance and can be touched. They define the body and existence as one single thing.[20]

As St Isaac the Syrian emphasizes, science accepts nothing that disagrees with nature.[21] It can therefore undertake only what is in agreement with itself.[22] It is always dependent on matter.[23] The very fact of its limits makes it fundamentally incomplete. As St Isaac said, 'it always lacks something'.[24]

These limits are in fact recognized by science itself, but it sees them rather as internal limits, linked to the present extent of its knowledge or to its understanding of reality, than as objective limits in relation to a great part of reality that is beyond it because of the very nature of that reality.

The problem for the Fathers is not basically the existence of internal limits (for example, the positive knowledge of God has such internal limits: man can never grasp God in his essence and even in his energies he can be grasped only partially. Such knowledge is always in a state of tension and movement toward more knowledge because of God's infinity). The problem is rather that, while remaining limited to the domain of nature, science—for whoever recognizes through it the existence only of natural, sensible things—deprives that person of the knowledge of another dimension of reality: the dimension beyond the natural. Thus St Isaac reproaches scientific knowledge in this way: 'It separates its disciples from everything that is foreign to the natural order'.[25] He constantly opposed scientific knowledge, which is a prisoner of nature, to faith, which is free in relation to it, because faith, on the one hand, is not limited to its domain, and, on the other hand, is freed from nature's laws and constraints. Science simply misses a great part of reality, but that reality is open to faith.[26]

Faith gives access to the knowledge of principles while science sees only certain consequences of them: those that manifest themselves in the sensible world, in the world of material phenomena. Faith thus includes, as a matter of principle, all the knowledge of science. Thus St Isaac judges that scientific knowledge is useful only to the extent that it can lead people to faith, but when they have reached faith, they no longer need scientific knowledge.[27]

[20] Clement of Alexandria, *Stromata*, II, iv, 15, 1.
[21] St Isaac the Syrian, *Ascetical Homilies*, 62.
[22] *Ibid.*
[23] *Ibid.*
[24] *Ibid.*
[25] *Ibid.*
[26] *Ibid.*
[27] *Ibid.*

Science seeks to explain only the mechanisms that govern the universe in the domain of nature itself. This principle is part of the very methodology of science. It is what epistemologists call 'the postulate of objectivity' according to which nature is sufficient unto itself and contains in itself the principle of its own intelligibility. Science refuses *a priori* to take into account any suprasensible principle and *a fortiori* any metaphysical principle for making sense of its objects. In doing this, science ignores, according to St Isaac, the true principles that govern the world, especially divine Providence.[28] It attributes to nature or to human activity things that in fact come from grace. In doing this, science produces an illusory knowledge. St Isaac accuses it of thinking it is sufficient unto itself, that is, of pride. He considers the universe of scientific knowledge as a world of shadows and darkness, for science is riveted on the earth, has no other reference than what is on the earth, and does not know that there exists something higher.[29] True knowledge is on the side of faith, which knows the real causes of phenomena that are beyond the natural world, and obscurantism is on the side of science, which ignores them.

The sciences and technical skills have, according to St Isaac the Syrian, been produced to deal with the material needs of man. He expresses this by saying that they are dependent on the body, and under the body's influence.[30] Dominated as they are by the body, they do not concern themselves with anything other than what is in this world. They contribute to separating man not only from faith but also from virtuous activities that are associated with it,[31] in other words from the spiritual life. And this we have already seen in St Gregory Palamas[32].

6. Science, that is knowledge of appearances, is inferior to spiritual knowledge, that is knowledge of the essences of creatures

According to St Maximus the Confessor, creation can be understood by man either spiritually, according to its intelligible reality that reveals God, that is according to its *logoi*, or physically according to its sensible appearances alone. Scientific knowledge seeks to define, in a rational manner, the laws that link the phenomena and to establish theories that unify these laws. In order to do this, it must often go beyond appearances, which, as Gaston Bachelard has emphasized in his epistemological reflection, are often misleading: phenomena (*τα φαινόμενα*) are what appear (*φαίνει*). According to Neokantian epistemology, which is in general the foundation of science today, scientific knowledge never knows reality as it is in itself, what Kant called 'the thing in itself', but only reality as it appears.

[28] St Isaac the Syrian, *Ascetical Homilies*, 63.
[29] *Ibid*.
[30] *Ibid*.
[31] *Ibid*. Cf., 65.
[32] St Isaac the Syrian, *Ascetical Homilies*, 65.

Since scientific knowledge is limited to the domain of nature, and in the domain of nature to phenomena, that is to appearances, St Isaac the Syrian makes it the lowest degree of knowledge, which has three degrees.[33] St Maximus the Confessor considered this knowledge, which apprehends nature only according to sensible appearances alone, to be a fruit of ancestral sin and the fall of man. He also considers such knowledge to be the lowest degree of knowledge. He opposed it to a form of knowledge that, while being on the level of nature, is nonetheless able to know and to understand the beings of nature beyond their sensible appearances, in their spiritual reality that corresponds to what they really are. This spiritual reality is defined by the *logos* or the *logoi* of their essence, each being having its *logos* that defines it in its individuality, but also *logoi* that are shared by it with other beings.

In the introduction to his *Questions to Thalassios*, St Maximus establishes the distinction between sensible and intelligible things in relation to the tree of the knowledge of good and evil, which represents the double aspect according to which Adam can consider creation. The knowledge of good corresponds to the sensible creation grasped spiritually, that is considered according to the *logoi* that it contains, by the mind (νοῦς), which is fed by these *logoi*.[34] Knowledge of evil corresponds to the creation considered materially, that is according to sensible appearances alone, the senses allowing themselves to be charmed by appearances and the mind being perverted.[35]

God called man to exclusively follow the first way by forbidding him access to the second by his commandment: 'Of the tree of the knowledge of good and evil, you will not eat' (Gen. 2:17). This prohibition, however, does not signify the devaluation of the sensible world, but only of the sensible way for man to use it.

Instead of following the divine commandment, Adam misused all his faculties, turning them away from their natural purpose, turning them against nature toward sensible reality, considered in and for itself. The result of this was the first and most serious of all evils: lack of knowledge of God.[36]

The conversion of fallen man in Christ should lead him back to the right path. The purification of his passions, which attached him exclusively to the appearances of this world, should allow him to accede to a knowledge superior to that which only deals with phenomena, a spiritual knowledge that St Maximus, following Evagrius, called natural contemplation (*φυσικὴ θεωρία*).

This contemplation seeks to grasp the *logoi* of creatures in themselves,[37] in other words to 'read' them in nature,[38] to examine them,[39] and to put them together.[40]

[33] *Ascetical Homilies*, 62; 63.
[34] *Questions to Thalassius*, Introduction (CCSG 7, 37.331–32).
[35] *Ibid*., 37.332–34.
[36] *Ibid*., 31.241–42 and 35.303–4.
[37] *Questions to Thalassius*, 13 (CCSG 7, 95.6–13; 25, CCSG 7, 161.39–42).
[38] Cf. *ibid*., 25 (CCSG 7, 161.42).
[39] *Ibid*., 32 (CCSG 7, 225.4–6).
[40] Cf. *Ibid*., Introduction (CCSG 7, 27.167–170; 25, CCSG 7, 161.42).

To accomplish this, it must disengage them from their sensible expression,[41] and thus distinguish in each being between its *logos* and its appearance.[42] Starting from sensible perception, it carries man beyond the senses.[43] Thus creation is no longer grasped in a carnal way but in a spiritual way.[44]

Natural contemplation discovers God,[45] the incarnate *Logos* in the *logoi* of beings, but it also discovers the Spirit that is present in creation.[46] In natural contemplation, the believer accedes to spiritual knowledge; the contemplation of nature gives 'science of beings'.[47] The logoi discovered, gathered and, as we have just seen, assimilated by the contemplative, do not have their only end in the knowledge that, through them, he has of beings, nor in the graces that God grants him when he contemplates them[48] but are above all destined to be offered to God[49]—certainly not because God might lack one of them, but in order to give him the praise he is due.[50]

This is the doxological and eucharistic use of creation, as opposed to the utilitarian use of nature introduced by technical skills and before that by the applied sciences, a utilitarian use that, as the French philosopher Cournot said, has caused man to go from the status of 'king of creation' to that of 'dealer of the planet'.[51]

The conception of St Maximus and the liturgical, doxological, and eucharistic use of nature constitute the theoretical and practical bases of a spiritual ecology, which for the modern world is an antidote to the unreasonable exploitation of nature's resources by modern technologies, which are, for the most part, application of the physical sciences, especially chemistry.

Conclusion

We can conclude from what we have said that the applied sciences are considered positively to the extent that their applications are positive, that is that they contribute to what is good for man.

As for their content, scientific theories are considered with a certain tolerance, going hand in hand with the awareness that there are many of them, and they are therefore relative. The rationality that is the basis of the scientific method is considered by the Fathers in a positive manner, on the condition that it is not a closed

[41] *Ibid*., Introduction, (CCSG 7, 27.167–170; 32, CCSG 7, 225.4–33; 51, CCSG 7, 395.7–29).
[42] *Ibid*., 32 (CCSG 7, 225.21–22).
[43] Cf. *ibid*., 24 (CCSG 7, 157.5–18).
[44] Cf. *ibid*., Introduction (CCSG 7, 37.335–336).
[45] *Ibid*., 32 (CCSG 7, 225.24–25).
[46] *Ibid*., 15 CCSG 7 p. 101.7–12.
[47] *Ibid*., 5 (CCSG 7, 67.42–43; 17, CCSG 7, 111.25).
[48] *Ibid*., 5 (CCSG 7, 67.42–43; 17, CCSG 7, 111.25).
[49] *Ibid*., 397.34–57 and 63–68, 403.136–144, 405.198–201; 65 (CCSG 22, 281.492–494).
[50] *Ibid*., 397.65–399.69.
[51] A. A. Cournot, *Considérations sur la marche des idées et des événements dans les temps modernes* (Paris, 1872), p. 422.

rationality, closed in on itself and ending up finally as a rationalism that refuses to accept any other faculty but reason and any other reality but what is recognized by reason. For the Fathers, reason is not autonomous but must be used in the service of the intellect and of God's revelation to which it gives access. In other words, the ultimate purpose of reason is beyond itself and beyond its content, of a natural order, to which science is limited.

The main problem that is posed by science, from the theological and spiritual point of view, is that its object is limited to the domain of nature, and therefore an important part of reality, that part that is above and beyond nature, is imperceptible to it. This is not a bad thing if science is aware of this limit and explicitly recognizes it. The danger, however, is that, in a rationalist perspective previously referred to (which was dominant all over Europe at the end of the nineteenth century and which was maintained during the twentieth century in societies where a materialistic ideology dominated), science sees itself as the only way of knowing the totality of what is real.

This objective danger linked to knowledge becomes a danger for knowledge itself. This danger is that it invests all its energy in this type of knowledge and remains ignorant of forms of superior knowledge linked to faith and spiritual experience, and these alone can open man to the totality of what is real and assure his spiritual development, and finally his salvation. In other words, there is in scientific knowledge, if developed in an exclusive manner, a risk of alienation.

And finally, the Fathers consider that even at the level of the knowledge of nature, whatever its degree of development and complexity, scientific knowledge remains a knowledge of phenomena, a knowledge of appearances, and therefore a superficial knowledge. It ignores the true nature of material things themselves, whose meaning is spiritual and is contained in their *logoi.* These are only accessible by spiritual contemplation (*φυσικὴ θεωρία*), which man can develop in himself only by ascetic activity, which is linked to divine grace and purifies his passions—that is his different forms of attachment to his own ego and to the appearances of things. By natural contemplation, which is for the Fathers superior to the first degree of knowledge, whose domain is science, man can have access not only to knowledge of the real nature of each thing, but also to the knowledge of their real laws, which are spiritual laws intimately linked to divine Providence that invisibly governs the world. For the Fathers, in other words, real science, at the first level, is the one that, behind the appearances of phenomena, reveals to us their spiritual reasons, their *logoi*, and that, through these *logoi,* leads us to the Logos, the Word of God, which is their real, ontological foundation and their ultimate, real purpose.

The Dialogue between Orthodox Theology and Science as Explication of the Human Condition

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The paper discusses the philosophical sense of the dialogue between science and theology. It starts with the recognition that the foundation of both science and theology originates in human beings, having an ambiguous position in the universe that cannot be explicated on metaphysical grounds but can be interpreted theologically. The dialogue between science and theology demonstrates that the difference in hermeneutics of representation of the world in the phenomenality of objects and the inaugural events of human life and religious experience pertains to the basic characteristic of the human condition and that the intended overcoming of this difference under the guise of the 'dialogue' represents, in fact, an existentially untenable enterprise. The paradoxical position of humanity in the world (being an object in the world and subject for the world) is treated as being the cause in the split between science and theology. Since, according to modern philosophy, no reconciliation between two opposites in the hermeneutics of the subject is possible, the whole issue of the facticity of human subjectivity as the sense-bestowing centre of being acquires theological dimensions, requiring new developments in both theology and philosophy. The intended overcoming of the unknowability of man by himself, tacitly attempted through the 'reconciliation' of science and theology (guided by a purpose to ground man in some metaphysical substance), is not ontologically achievable, but demonstrates the working of *formal* purposefulness (in the sense of Kant). Then the dialogue between theology and science can be considered a teleological activity representing an open-ended hermeneutics of the human condition.

Introduction

In any possible discussion of the relationship between theology and science (if theology is understood as experience of God through life and the physical sciences as explorations of the world within the already given life) there a question arises: What is the model that could best describe the relation between the experiential aspects of life and the knowledge of the world that positions humanity as one thing among others? In other words, if the Divine is perceived as the realm of the transcendent out of which life originates, whereas the operational realm of the physical sciences is related to the created world, the mediation between theology and science should *de facto* become an outward scientific explication of the meaning of the human condition in communion with the giver of life. This is a different perspective on the

dialogue in comparison with the one offered by traditional natural theology, which concentrates on making inferences from the world to God. A natural theology based on modern science does not represent a particular interest because it is clear in advance that the open-ended nature of the scientific enterprise will always contribute to the hermeneutic of the created world, thus indefinitely shaping the content of the natural theological conjectures with no hope of finding any certain evidence to the claim that it is God who created and sustains the universe. The infinite advance of science places modern natural theology in a condition of *uncertainty* about any claim of whether the world is created by God, or it is self-sufficient and requires no appeal to the transcendent in order to justify its existence.

The physical sciences treat the world as immanent, self-sufficient and explainable by means of the physical laws. It does not pose any question about the foundation of the contingent facticity of these laws (i.e., the question about their sufficient reason). In this sense, the question about the contingent facticity or concreteness of worldly reality (e.g., the concreteness of the global physical parameters of the universe such as its size and age) cannot be posed at all by the physical sciences. One can also add that the physical picture of the world is built and advanced by man in a condition of impossibility to understand why science (as a specific modus of human activity) is possible at all. Then, there is a question: what is the aim of the so-called dialogue between theology and science when neither theology nor science understand the foundations of their very possibility, and both function apophatically, knowing in advance that neither the meaning of communion with God nor the mystery of conscious embodiment in the universe will be disclosed? Theology refers to the contingent facticity of the world as being created out of the free love of God, whereas science explores this facticity as already given. If the sciences attempt to make inferences from the world to God by searching for the signs of his presence, these signs always remain *uncertain* for they relate to the unknowable God, whose ultimate sense cannot be exhausted through the signifiers borrowed from this world. If theology, by doing the opposite, places the content of its assertions in the physical context, it experiences another difficulty because it attempts to present *events* of communion with the infinite God in rubrics of space and time—that is, by using a philosophical language in order to enframe them in the phenomenality of finite objects. The fact that this does not make sense creates an opposite situation that points to a *certainty* of a negative kind.

Thus, the dialogue between theology and science always remains in the boundaries of the human incapacity to break through the oppositions between the *negative certainty* of philosophy (in relation to establishing whether the ultimate sense of the world is in God or not), and, alternatively, the ever *positive uncertainty* of science, which constantly advances its content and re-evaluates its own ontological claims with no hope for their convergence to some objective truth. Both the *negative certainty* of philosophy, with respect to ultimate questions, and the *positive uncer-*

tainty of science, with respect to knowledge of finite things, point towards a particular transcendental structure of human subjectivity that either struggles with the discursive justification of existential theological convictions or, alternatively, cannot existentially come to terms with the a priori limited capacity of discursive reason to produce *certain* statements about reality. In fact, the dialogue between theology and science, seen philosophically, represents an intellectual endeavour of balancing in one human subject the *negative certainty* about the impossibility of any response to the questions of existence of God, origin of the world and man, with the *positive uncertainty* in producing claims about the presence of God in the world, the origin of the world and man, from within the scientific enterprise. This balancing between two opposites in one and the same human subject (the inexplicable mystery of being the centre of disclosure and manifestation of the universe and, at the same time, being a thing among other things) represents a basic feature of the human condition in which the ultimate reconciliation of these attitudes seems to be impossible.

Indeed, a careful insight points to the fact that both theological convictions and scientific articulations originate in one and the same humanity, whose essence and sense of existence remain in both cases only *interpreted* but not fully understood. In other words, the link between the Divine and creation is detected by human beings who stand at the crossroads of the worldly and trans-worldly (being in an old-style parlance microcosm and mediator). The very possibility of formulating the task of mediation between theology and science belongs to humanity, so that inevitably the centre of this mediation and an enquiry is the human being itself. The view that humanity is the major theme of the dialogue between theology and science can be confirmed by making a parallel between the formal distinction and difference between two terms of the dialogue and the famous philosophical paradox of subjectivity, which dramatizes the ambivalent position of humanity in the universe as, on the one hand, being the centre of disclosure and manifestation of the universe, and, on the other hand, being one tiny physical part of this universe. The main argument of this text is that the dialogue between theology and science is exactly an attempt to elucidate and mediate between the terms of this paradox.

The central philosophical fact for any discussion of the relationship between theology and science remains that the world and humanity are disclosed from the already existent facticity of life within the rubrics of the specifically human consciousness. As an existential phenomenologist would say that the fact of life and disclosure of the world from within it is a basic fact and the beginning of any further articulations of the world. This observation leads to the following conclusion: in spite of the fact that the facticity of the human articulating consciousness cannot be explained metaphysically, being chained to the interiority of life, if this consciousness enquires into the sense of differentiation between the givens of theology and science, these givens must be existentially unified in order to articulate the sense of the Divine and the sense of the world in one single consciousness. The mediation

between theology and science must then go down the route where the predication of God and the world both contain a unifying human element that is constitutive for our sense of God as well as of the world. In a way, this type of mediation between the Divine and the worldly must itself have some traces of the initial creation of the world and humanity. In other words, the logic of mediation between God and the world through man must have been implanted in the initial intention of God while creating the world and man. Then the sense of the dialogue between theology and science can be seen as an attempt to disclose the motives of creation through which the apparent tension between theology and the sciences (manifested in the paradox of subjectivity) could be *morally* overcome.

In order to disclose these motives and bring them to articulation, we point to the problematicity of the very knowability of the universe as a whole. Human beings are bodily limited in space and their physical brain comprises, let us say, 20 cm on a liner scale. However, it is within this scale that human beings are capable of articulating the whole universe from its microscopic scales to the scales of clusters of galaxies and the entire universe. If this brain functioned only on the level of causal physical laws, it could not be able to transcend the immediately given physical region and produce an instantaneous synthesis of the universe, which is physically incommensurable with the human brain. Nevertheless, the capacity to do so points towards the fact that human consciousness is fundamentally non-local and has features enabling humans to view the universe from the God-given perspective. The question is: where does this capacity come from? Modern evolutionary epistemologists and adherents to the theories of emergent complexity would argue that all this is the result of the long adaptive evolution in which consciousness ultimately appears as an epiphenomenon of the physical. Their optimistic efforts to reconcile the *physically empirical* with the *philosophically intelligible* represent a contribution to a *hermeneutic* (not explanation) of the human condition with no hope of making this hermeneutic ontological. In view of this one could proceed through a different, Christian hermeneutic of the human phenomenon as made in the Divine image, more concretely in the archetype of Christ, who was the Word-Logos of God incarnate in flesh of Jesus of Nazareth. The event of the Incarnation was the only historical reference pointing to the unification of the Divine and the worldly in the Hypostasis of the Logos of God through whom and by whom all was made. And it is this unification that forms that *archetype* of searching for the reconciliation in the human articulation of experience of God (manifested in 'seeing' the universe as the unity of creation in a God-like fashion) and the world (explored scientifically), being *de facto* the task of the dialogue between theology and science. Regarding the archetype, we make a clear distinction and difference between Christ's hypostatic union of the Divine and human in the hypostasis of the Logos, where no tension between the worldly and its being created exists, and that communion between God and the world, which human beings have to effectuate in space and time, for example in their scientific ex-

plorations. Humanity is capable of attempting such a communion only in consciousness, whose created hypostasis *imitates* (that is, uses as an archetype) the Hypostasis of the Logos. In this sense, the goal and an 'infinite task' of the dialogue between theology and science can be seen as a conscious mediation between its terms with the purpose to effectuate communion of creation with God through man in the image of the Logos. In this case, the contingency of the created world as it is seen through the Divine image in man acquires some features of necessity related to the possibility of the Incarnation.

If the Incarnation is understood traditionally, as related to the embodiment of the Logos in the human flesh of Jesus of Nazareth, then its possibility is related to the existence of Jesus' body and the body of his Mother, the Virgin Mary. In this case, the logic of creation must have contained the possibility of such a development of the universe that Jesus' body, being consubstantial to bodies of all other humans, could emerge in the process of cosmological and biological evolution. Effectively, if the starting point of the dialogue between theology and science is man, so that the universe must contain the conditions for man's existence, then the role of science in the dialogue is to explicate the sense of physical reality in the context of this existence. One can definitely recall the cosmological Anthropic Principle (AP) attempting to create a causal link in the inference from humanity to the universe. However, in the context of the dialogue with theology, this AP acquires some new qualities, related not only to human biological bodies (and Jesus' flesh) but to the possibility of the Incarnation of God: the AP becomes a Theo-Anthropic Principle, implying that the universe must have had from the beginning the conditions for the Incarnation, assuming that the Incarnation, according to the Nicene Creed, was prepared by God before creating the universe.[1]

The link between the possibility of the Incarnation and the structure of the universe is assumed only on the level of the *necessary* conditions: indeed, the universe in its actual display is *necessary* for the Incarnation to take place, but not *sufficient*. If, by the virtue of a philosophical mistake, one would equate the *necessary* conditions with the *sufficient* ones, one runs the risk of ontologizing the Incarnation of God in Jesus Christ and transferring the fleshly revelation of God in Christ to all structural levels of reality. A theological move in this direction happens in modern discussions of Christology called 'Deep Incarnation'.[2] Their essence can be expressed as follows: that 'the Incarnation of God in Christ can be understood as a radical or "deep" incarnation, that is, an incarnation into the very tissue of biological existence, and

[1] See, for example a classical book of T. Torrance, *Space Time and Incarnation* (Oxford: Oxford University Press, 1986), as well as articles of G. L. Murphy, Cosmology and Christology, Science and Christian Belief 6 (1994), 101–111; 'The Incarnation as a Theanthropic Principle', *Word & World* 8.3 (1993): 256–62.

[2] For a general introduction, see for example a book of Denis Edwards, *Deep Incarnation. God's redemptive suffering with creatures* (Maryknoll, NY: Orbis Books, 2019), as well as the volume edited by Niels Gregersen, who coined the term 'deep incarnation', *Incarnation. On the Scope and Depth of Christology* (Minneapolis: Fortress Press, 2015), 361–80.

system of nature'.[3] Formulated in such way, this idea would implicitly assert that that modern physics and biology contribute to the theories of the immanent presence of God in the world, risking to make the Incarnation a new type of metaphysical doctrine where the distinction between the necessary and sufficient conditions for the possibility of the historical Incarnation effectively disappears. A situation where a distinction between the *necessary* and *sufficient* conditions concerned with some extraordinary events (such as the Incarnation) can be found in the evolution of the universe, including, for example, that of the appearance of life in general and the life of Homo Sapiens. Indeed, the necessary physical conditions on this planet do not entail the appearance of life forms, a cell for example.

Biology at this stage of its development is not capable of producing a living cell from an inorganic matter. The very idea of evolution in all its complexity turns out to be so incredibly complex and improbable that scientists doubt that if nature on Earth had to start it again it could actually happen, and even if it happened, then its outcome would hardly be the same. The lack of understanding of the sufficient conditions for the evolution of life on this planet represents a serious problem for astrobiology, because the existence of exoplanets detected from Earth does no guarantee actual existence of life. Since the Incarnation is linked to the fact of existence of intelligent life on Earth, the sufficient conditions for the Incarnation are not understood—not only theologically, but first of all scientifically. Physics, through cosmology and astrobiology, just confirms this by showing that the more we understand the sense of biological life, the more we understand our incapacity of explaining its origin, in particular the origin of intelligence. All this points with a new force to the fundamental premise of any theologising and scientific knowledge, namely the unknowability of the sufficient conditions for existence of humanity and hence the unknowability of the possibility of knowledge as such. The sciences operate in the conditions of this unknowability and through its advance they explicate this unknowability even further. In this sense, one can guess that the dialogue between theology and science also explicates in a characteristic way the unknowability of man by himself reformulating the paradox of subjectivity, making the unknowability of man specifically palpable.

From what we have discussed so far, one could propose the following methodology of elucidating the sense of the dialogue between theology and science. First, the very facticity of the dialogue points to the fact that humanity exists in a paradoxical split of its intentionalities of consciousness with respect to its position in the world, reflected philosophically in the paradox of subjectivity. Correspondingly, any attempt of reconciliation of the terms of the dialogue is tantamount to an attempt to 'resolve' the paradox of subjectivity. Theology provides a reference to such a possible 'resolution' effected in the Incarnation of Christ. If the latter is taken as an archetype

[3] N. Gregersen, 'The Cross of Christ in and Evolutionary World', *Dialog: A Journal of Theology* 40.3 (2001): 192–207 (205).

for the elucidation of the sense of the dialogue, this dialogue becomes intrinsically theological, contributing to an open-ended hermeneutics of the human condition in which humanity effectively copes with its own unknowability along the Christian path of life.

The Unknowability of Humanity at the Inception of the Dialogue

As we have pointed out elsewhere,[4] in spite of the explicitly ontic features of theological propositions (as distinct from the ontologically rooted natural sciences), the very ontic needs to have an ontological basis (as a corporeal basis of a subject), whereas the ontological condition must be elucidated ontically through the structural path of its constitution by the subject. Thus, the strict demarcation between theology and science on the basis of the opposition between ontic and ontological can hardy be achieved, contributing to the two-fold argument that a naïve positing of experience of the Divine outside the material conditions of the possibility of its expression, represents *de facto* faith without reason (whose existential and soteriological meaning remains obscure), whereas, at the same time, any physical reductionism in the constitution of humanity also fails without an appeal to theology of humanity's creation. The mediation between theology and science does not represent any metaphysical necessity but represents events of life—that is those dimensions of the human will and reason that cannot be deduced on the grounds of causality pertaining to the world.

The facticity of the dialogue points to the fact that it represents the event-like phenomenon related to life's self-affectivity, so that its interpretation demands a philosophy that deals with the phenomenon of man as 'event' of Life, the phenomenon that has a 'meta-ontological' status, ordaining and justifying the very possibility of the philosophical as well as scientific knowledge of the world.[5] However this 'event of life', or, simply put, the human phenomenon, being given to humanity, does not receive any further elucidation by man himself. The self-imposed question, 'What is man?', remains unanswered. Seen from this standpoint, all human activities, including those of science as well as religious experience, originate in one and the same man in the conditions that this very man does not understand his own essence. Then both theology and science, as well as the dialogue between them, are functioning in the conditions of man's self-incomprehensibility. The sciences and religions are efficacious on the level of phenomena since they describe the facticity of life and explicate the sense of humanity through a never-ending hermeneutics of the world. In a way, human activities give witness to that which is unknowable in

[4] A. Nesteruk, 'Philosophical Foundations of Mediation/Dialogue between (Orthodox) Theology and Science'. In *Orthodox theology and Modern Science: Tensions, Ambiguities, Potential*. Eds V. Makrides and G. Woloschak (Turnhout: Brepols Publishers, 2019), 97–121.

[5] Ibid.

man, contributing to a view of humanity as an 'infinite task' for itself. According to K. Jaspers, 'We cannot exhaust man's being in knowledge of him, we can experience it only in the primal source of our thought and action. Man is fundamentally more than he can know about himself'.[6] The sciences, philosophy, and theology all pose questions to man about man himself that cannot lead to any definitive answer, thus provoking further questions.[7] Correspondingly, the dialogue between theology and science, as a particular modus of the human enquiry in the nature of things, contributes to further explication of the riddle of man with no aim of creating any metaphysical concept of man. The seeming dualism in comprehension of reality, either on the grounds of the sciences or through theological insights, explicates the dualism in the human condition between *being* and *having*: 'We are, but we do not possess ourselves',[8] that is we are, but it is not us who created us. One can say that man has his own 'I' as a co-participant of the infinite all-embracing being; however, it is because of the infinite character of such a communion with being that man cannot comprehend the sense of this communion's contingent givenness. As the sciences explicate the modus of 'we are', that is the outward way of our existence as things (objects), they do not explain as to 'why we are', that is, why humanity is given to itself in such a way that the detection of the 'we are' is possible at all. The drama of not being able to create himself is transferred by man to the cosmological scale when man is not able to understand his place in the universe. Being groundless in the universe, humanity does not *have* its own home—not only in the sense of space, but also in the sense of the laws that it cannot control. Theology clarifies this issue of man not being able to possess himself by transforming it to the issue of participation *in* and communion *with* that which escapes the limits of metaphysical definitions.

The sciences play a twofold role in comprehending and formulating the sense of man's unknowability and groundlessness in the universe. It is science that makes it possible to bring on board outward aspects of man's unknowability through its insignificance in the physical universe. Without a scientific refinement of the predicaments of the human condition, man would not be able to understand the scale of his *epistemological significance* for comprehending the universe and developing an articulated capacity of longing for the ultimate ground of its existence, either in the world or beyond it. The ontological groundlessness of humanity is exactly that intrinsic part of the human condition that provokes humanity to search for grace or 'blessing' for its existence from that which is beyond the world and man himself.

The predisposition of transcending the sphere of the unconcealed relies on participation and communion with that which is beyond the visible and sensible. This transcending, even if it is not initiated by the sciences, is reactivated in man and

[6] K. Jaspers, *Ways to Wisdom* (New Haven: Yale University Press, 1954), 63. See also p. 66.

[7] C.f. J. Moltmann, *Man. Christian Anthropology in the Conflicts of the Present* (London: SPCK, 1974), 2.

[8] H. Plessner, *Conditio humana* (Berlin, 1961), 7.

made existentially dramatic through cooperation with the sciences. One cannot assert that the sciences are paving the way to a theological apprehension of the world, but at least one finds them refining the delimiters of the human condition, turning to a theological search for the sense of existence. It is in this sense that the unknowability of man by himself, endorsed by scientific knowledge, becomes a factor for engaging with theology through abandoning any straightforward attempts to overcome this unknowability on the grounds of metaphysical concepts. The implicit hope and longing for overcoming the man's incapacity to know himself , present in the modern sciences and some branches of philosophy, forms a hidden *purpose* implanted in the core of the human condition. This *purpose* is to acquire a 'home' in being, to ground man in that which he always transcends. This *purpose* is not ontologically achievable,[9] so the whole process of knowledge is driven by this *purpose* only *formally*, that is as a *teleological activity without a material purpose*. The latter implies that the 'reconciliation' between science and theology could not be achieved so that the dialogue between them can be considered a teleological activity without a *material purpose*. Theologically, this activity could be understood as a *mediation* between moral divisions between his sense of creaturehood in the midst of the physical world and, at the same time, his being in communion with that which is beyond this world.

The Paradox of Subjectivity and the Dialogue between Theology and Science

The condition of man's unknowability by himself can easily be explicated through the so-called paradox of subjectivity[10] whose concise formulation is: 'We can describe the relations between subject and world as purely intentional relations as opposed to (objective) spatial, temporal, and causal relations. We can appeal to the distinction between belonging to the world of objects and being a condition of the possibility of the world of objects (as meaning). Perhaps the broadest terms for these relations would be the *transcendental* relations and the *part-whole* relation',[11] or 'It is necessary to combine the recognition of our contingency, our finitude, and our

[9] 'If he [man] ever finally got "behind himself", and could establish what was the matter with him, nothing would any longer be the matter with him, but everything would be fixed and tied down, and he would be finished. The solution of the puzzle what man is would then be at the same time the final release from being human' (Moltmann, *Man*, 2).

[10] The formulations of the paradox are abundant. See e.g., I. Kant, *Critique of Practical Reason*, Conclusion, in *Kant's Critique of Practical reason and Other Works on The Theory of Ethics*, Trans. T. K. Abbot (London: Longmans, 1959), 260; E. Husserl, *The Crisis of European Sciences and Transcendental Phenomenology* (Evanston: Northwestern University Press, 1970), 179. The review of different formulations of the paradox can be found in A. Nesteruk, *The Sense of the Universe* (Minneapolis: Fortress, 2015), 136–61. See also D. Carr, *The Paradox of Subjectivity* (Oxford: Oxford University Press, 1999).

[11] Carr, *The Paradox of Subjectivity*, 116.

containment in the world with an ambition of transcendence, however limited may be our success in achieving it'.[12]

The paradox, as the co-existence of two attitudes to the hermeneutics of the subject, appears to be a structural element of human subjectivity in general. The self-givenness and self-affectivity of 'the subject' implies the question of the facticity of consciousness, which is missing from any articulations of the world. As was expressed by M. Merleau-Ponty,

> …consciousness attributes this power of universal constitution to itself only if it *ignores the event which provides its infrastructure and which is its birth*. A consciousness for which the world 'can be taken for granted', which finds it 'already constituted' and present even in consciousness itself, does not absolutely choose either its being or its manner of being.[13]

It is because of the inexplicability of the facticity of consciousness in metaphysical terms that it can be considered an 'event',[14] an event of the existence of man. The temptation to find that missing foundation of its own realization in existence leads consciousness to transcendence in a theological direction, which exceeds the scope of philosophy but, at the same time, extends philosophy towards the appropriation of those realities that escape the phenomenality of objects.[15] Then the paradox of subjectivity cannot have a metaphysical explanation and falls under the rubrics of *event*, that is something as given with no recourse to its possible metaphysical justification. In this case, the reconciliation of the terms in the paradox is equivalent to the elucidation of its very appearance in the subject—that is appearance of a personal subject, which is treated as *event* in the sense that no metaphysical explanation for existence of this subject is possible. Theology inevitably enters the discourse for, as we argued before, events are a 'natural' domain of theology.[16] The problem of origin of the paradox is reduced to the existence of the pre-predicative world, the life world, which in its sheer givenness is not reducible to anything in the natural world.

[12] T. Nagel, *The View from Nowhere* (Oxford: Oxford University Press, 1986), 9.

[13] M. Merleau-Ponty, *Phenomenology of Perception* (London: Routledge & Kegan Paul 1962), 453 (emphasis added).

[14] *Event* can be described as the consummation of that whose essence did not give the possibility of its foreseeing, as if one could foresee the inconceivable impossible from the perspective of the conceivable possible (that is from within metaphysics with its principle of causality). See details on phenomenology of events in C. Romano, *L'événement et le monde* (Paris: Presses Universitaires de France, 1998).

[15] In general, the term 'phenomenality' describes the quality or state of a *phenomenon*. For example, phenomenality of mundane things corresponds to their being perceptible by the senses or through immediate experience. This constitutes the notion of the phenomenal world as the world of visible, empirical phenomena. One can talk about phenomenality of objects as entities being constituted according to the rubrics of 'I think', so that such a phenomenality can be described in four rubrics: quantity, quality, relation, and modality. The phenomenality of objects is different from the event-like manifestations, whose phenomenality cannot be reduced to the stated four rubrics and where there is the excess of intuition over the discursive faculty.

[16] Nesteruk, *Philosophical Foundations,* Op. cit.

Its interpretation proceeds from the theology of creation of life connoting with the Life understood as Divine Being. In words of M. Henry:

> I am not only for myself, i.e. this individual appearing in the world, a thing among things, a man among men…. In order to relate everything to oneself, one must first of all be this Self to whom everything is related, one must be able to say *I am me*. But the point is that this *I am me* is not at all originary... A Self such as that of man, a living transcendental Self – such a Self is only ever to be found in the 'Word of life' of the first letter of John, whom Paul describes as a 'First Born among many Brothers' (Romans 8: 28-30).[17]

In other words, the transition from the philosophical paradox to its theological sense can only be made by reducing the facticity of the paradox to the impossibility of its metaphysical description, that is to 'event', manifesting God's creation of that which is metaphysically impossible (and hence unexplainable).

Theologians of the past expressed the paradox in terms explicitly containing a reference to that which is beyond the world, that is to the fact that the paradox explicates the condition of creaturehood. In his Epistles to Romans, Apostle Paul recapitulates man's paradoxical created condition by contrasting his serving God's Law with his mind, and serving the law of sin with his unspiritual nature (Rom 7:25). Maximus the Confessor advocated that God's image in man made him capable of mediating between moral divisions in himself and in creation in general, for example between the sensible (visible universe) and intelligible (invisible, for example an image of the world's wholeness in consciousness): 'As a compound of soul and body he [man] is limited essentially by intelligible and sensible realities, while at the same time he himself defines [articulates] these realities through his capacity to apprehend intellectually and perceive with his senses'.[18] The Russian philosopher V. Soloviev explicitly referred to God in his description of the human ambivalent condition: 'Man comprises in himself all possible oppositions, all of which are reduced to one great opposition between the unconditional and conditional, or between the absolute and eternal being, and a transient phenomenon, an illusion. Man is *deity* and *nothing* at the same time'.[19]

Now it is reasonable to pose a question on whether the impossibility of metaphysical explication of the paradox of subjectivity (that is unknowability of man) characterises something fundamental in the human condition that as such represents an element of its constitution in reflection. The philosophical impasse here

[17] M. Henry, 'Phenomenology of Life', *Angelaki* 8.2 (2003): 100–110 (104).

[18] Maximus the Confessor, *Ambigua* 10:26 (PG 91:1153B) [ET: 'Various Texts on Theology, the Divine Economy, and Virtue and Vice', 5:71, in *The Philokalia: St. Nikodimos of the Holy Mountain and St. Makarios of Corinth. The Philokalia: The Complete Text*, 4 vols., eds G. E. H. Palmer, P. Sherrard, and K. Ware (London: Faber, 1979–95). v. 2, 277].

[19] V. Soloviev, *Readings on Godmanhood* (Moscow: Pravda, 1989) (in Russian).

may be elucidated through an appeal to theological anthropology relating the present human condition to the event of the Fall. In other words, the question can be posed like this: does the paradox of subjectivity in its outward formulation manifest the essence of that which represents a consequence of the event of transgression from union with God granted to the first man at the moment of his creation (implying that the first man was knowable to himself)? If this is true indeed, the consequence for our topic would be also manifesting and conclusive: the dichotomy between a scientific and theological vision of the world would originate in the Fall and the very *telos* of reconciliation between them can be treated as the healing and redemption of sin, which ultimately would resolve the paradox and thus unify theology and science. In addition to such a conclusion, one could argue that the split between science and theology encapsulates that characteristic feature of the post-lapsarian condition of man and the world, which Yannaras emphatically described in terms of 'evil'. According to Yannaras, the paradox of subjectivity is a particular form of explication of 'evil'.[20]

Yannaras's reading of the paradox through his understanding of man (as a creature longing for immortality but facing a defeat by the laws of nature)[21] contributes to the longstanding discussion of the paradox by philosophers, qualifying it as an expression of the basic *anxiety* of humanity in the world, its despair and non-attunement to the world, depriving man of understanding of the sense of existence. Can the paradox of subjectivity (implied in Yannaras's quote) thus be treated as a definition of 'evil', related to the human incomprehension of his own condition, that is to the condition after the Fall? Or does the notion of 'evil', invoked by Yannaras, have a sense independent from the Fall and inherent in the condition of creaturehood as such? I would incline to defend the second option because of one striking theological observation, namely *that the unknowability of man by himself (entailing the paradox and the sense of the autonomy of nature in him) is part of his Divine image*. The fact that human nature is unknowable follows from its being an image and likeness of God, that is of that One Who is unknowable. In a classical excerpt from patristic texts, Gregory of Nyssa states: 'Since the nature of our mind, which is the likeness of the Creator, evades our knowledge, it has an accurate resemblance to the superior nature, figuring by its own unknowability the incomprehensible Nature'.[22] This entails that any attempted resolution of the paradox of subjectivity, as a search for the answer to the question 'What is man?', qualifies such an attempt (in which man defines himself in terms of something that is less than God) as a distortion of the

[20] C. Yannaras, *The Enigma of Evil* (Brookline, MA: Holy Cross Orthodox Press, 2012), 16.

[21] C. Yannaras, *The Meaning of Reality* (Los Angeles: Sebastian Press & Indiktos, 2011), 123–43.

[22] Gregory of Nyssa, *De hominis opificio* [ET: *On the Making of Man,* NPNF 5, 387–427 (397)]. See on the unknowability of man an article J.-L. Marion, 'Mihi magna quaestio factus sum: The Priviledge of Unknowing', *The Journal of Religion* 85.1 (2005): 1–24, as well as a chapter from J.-L. Marion, *Certitudes négatives* (Paris: Bernard Grasset, 2010), 21–86.

Divine image.[23] One can suggest that for the first man the question of 'What is man?' did not exist in the same form as it is posed by us because of his union with God, as following God, keeping him free from the anxiety of existence as creaturehood. In this case, the event of the Fall can be characterised as the loss of the primordial 'privilege of unknowing' and the lapse in the state of anxiety and homelessness in the world. Then the paradox (as an encapsulated 'response' to the question 'What is man?') explicates in a positive fashion the essence of the ambivalence of the human condition: it exists subject to the physical conditions of the world, but in the Divine image that is in communion (not union!) with God.

Then the question is: what is meant by evil in Yanaras's reformulation of the paradox? Since the assertion of unknowability of man is based, *de facto*, on a premise that he cannot create himself whilst, as a creature, holding the Divine image, the Fall can mean only a change of attitude to this inherent creaturely condition. In this case, that evil to which Yannaras refers is related not to the ontology of the created world but to evil in man as the loss of the privilege of being in *union* with all creation and God, resulting in his separation from the world and seeing it just as a medium of necessity and slavery, an obstacle in man's ambition for transcendence. In this sense, the drama of the paradox as well as the tension between science and theology represent such an attitude to the sense of existence in which the basic condition of creaturehood (as a premise for being in communion with God-Creator) is forgotten. This makes it possible to treat Yannaras's interpretation of the paradox in terms of evil in a *moral*, but not ontological sense, explicated in similarity with those moral divisions in creation that were at the center of Maximus the Confessor's theology of deification as mediation between these divisions and, ultimately, mediation between the created and uncreated, between the world and God. Seen in this perspective, we argue that the paradox explicates the basic predicament of the human condition as being *a creature in communion with God*. However, as we will discuss below, it is this predicament that paves the way for man's deification: to be deified, one must be created.

If the conditions of 'evil' in Yannaras's sense correspond to the moral tensions related to the apprehension of the world and man's inability to comprehend its facticity through the corporeal cognitive faculties, one can argue that the sciences help humanity to adapt to the conditions of 'evil' in man himself, that their primary task is to articulate, although indirectly, particular aspects of this 'evil'. One needs to see 'evil' in order to develop an impetus for transcending its conditions. In fact, even to articulate the ambivalence in the human condition as 'evil', one needs *grace*,

[23] J.-L. Marion in his *Certitudes negatives*, p. 41, quotes a passage from St Augustine's *De Trinitate* 10.5.7, in which, as Marion claims, a phenomenology of sin is represented through describing the human soul as turning away form God, 'slithering and sliding down into less and less, which is imagined to be more and more'. What is implied by this is that any attempt of man to define himself on the basis of the human only is tantamount to denying life as the gift of that other than man—that is, God—through resemblance with whom man resembles himself, and thus is only capable of defining himself.

as that move which positions 'evil' in man beyond his natural condition. In view of this, one reasonably comes back to the question of the sense of the dialogue between theology and science. Science dispassionately articulates the conditions of 'evil' (that is natural conditions), without giving any moral judgment on whether nature (as being recapitulated in man) is good or bad for humanity. The moral judgment comes from theology, which contrasts the ends of nature with the ends of humanity, and which Yanaras described as the 'autonomy of nature [that] we human beings see a challenging "absurdity" (a violation of our own rational conception of *meaning* in the world)'.[24] In his desire to subordinate the ends of nature to the ends of himself, man exercises his archetypical 'likeness' to God by knowing and judging things according to his free will.[25] However, man's actual incapacity to transform nature—and first of all his own nature—in the manner of its creator, is determined by the fact of creaturehood. Correspondingly, the notion of 'evil' that is invoked in Yanaras's quote can be treated as a certain misuse of the Divine image in man, who attempts to tame the ends of nature (in order to define himself) not through his privilege of creaturely communion with God, but through his illusion of the unlimited power of controlling the material world through reason. This ambition of man is his moral problem related to the ignorance of the fact that his privilege of the Divine image is the result of otherness with respect to God—that is, creaturehood in communion.

The overcoming of this 'evil' in man, that is, mediation of moral tensions between parts and aspects of creation in man himself, cannot be done metaphysically; that is, no philosophical concept is possible that would resolve the riddle of man without referring it to the theology of creation. The sense of creaturehood arrives only through grace in communion, which *de facto* means existential transcendence. The possible overcoming of the difference between human ends and the ends of nature can only be seen in terms of soteriological purposiveness, avoiding any ontological reference either to the natural state of man or to any particular modus of the natural in the world, which would allegedly manifest the achievement of such a purpose. The theology of Maximus the Confessor on man's mediation between moral tensions (divisions) in creation always warned its readers that no ontological bridge between creation and its creator will be possible through mediation and deification. In other words, the ends of nature will never be subordinated to the ends of humanity on the ontological level. On the moral level, the ends of man and the ends of nature can be reconciled through such a transfiguration of the spiritual insight in man that will ease the drama of nature's autonomy and make humanity free not from the conditions of nature, but from the anxiety of creaturehood.

One can summarise that the unknowabililty of man by himself, expressed through the paradox of subjectivity, encapsulates the essence of the moral division

[24] Yannaras, *The Enigma of Evil*, 16.

[25] The analogy comes from St Maximus the Confessor's discussion that God knows created things according to his will (*Ambigua*, 7, PG 91:1085B).

in man between his limited created position in the physical world and his intellectual and spiritual capacity to transcend the world and to long for the unconditional and eternal. The dialogue between theology and science then represents a future explication of man's drama of creaturehood, providing us with the open-ended hermeneutics of man's created existence in communion with God.

The Incarnational Archetype in Humanity as the Approach to the Dialogue

The approach to the question 'What is man?' through the notion of communion receives its biblical justification through the answer that God gives to Moses: 'I will be with you' (Exodus 3:12). It is the way how that God who can say 'I am who I am' (Exodus, 3.14) that tells Moses that he will be with him. The whole essence of the question 'Who am I?' as a concrete incarnation of the question 'What is man?' entails, through the encounter with God, the answer that is not a direct response to that which is asked. Rather this is an indication that the implied sense of the response can only be given in the form of an invitation of man into God's midst through the way of life. Communion is thus following the same imperative of God 'I will be with you' on the side of man: 'I will be with You by following You'. By accepting God's communion, man does not receive any answer on what he can or cannot know, what he ought or ought not do, what he may or may not hope for: thus he does not receive an answer to the question of 'What is man?' as it was formulated by Kant. For God indicates to man that this question cannot be addressed and responded in abstraction simply because without communion with God it does not have sense and cannot be clarified. 'Man is man only in communion with God' means that God offers man the way, which constitutes his history and endows him with the future. There is no being of man as such, devoid of the inaugural event of communion with God enabling man to have future, that is life. In other words, the 'knowledge' of man by himself as such turns out to be the unfolding of his history towards that for which this history was created: man receives the sense of his *telos* formulated not in terms of those potentialities that are implied in the three Kant's questions, but through the definition of communion. It is only by following this God-given (through communion) purpose that man can indefinitely unfold and constitute the sense of its own existence knowing in advance that the ultimate union with God, phrased theologically as deification, will yet leave untouched an inerasable difference (*diaphora*) between a creature and the Creator. It is a dedication to this *telos* that releases man from the incessant idolatry of his images of himself, thus effectively removing all dramatism of the unanswerable nature of the question 'What is man?', through which God releases man from any search for rootedness in the rubrics of the world by constantly reminding to him that while being in the world, man is not *of* the world. Man's anxiety of his contingence and homelessness in being, entailing the question of 'What is man?', is intended to be replaced by offering home

in God's midst, that is through being introduced to communion with God, who will be with him on all his ways.

Then the refusal to follow God, meta-historically associated with the Fall, meant that man imagined that he could attain to himself by choosing to resemble something less than God. This is rather a paradoxical situation: to be man in communion with God is to remain in the conditions when man's Divine Image is detected, but not defined. If man attempts to define himself in some metaphysical terms pertaining to the world, that is if he denigrates his existence from transcendent communion to some immanent attribution, he effectively commits *sin* because he co-relates his humanity to something that is less than God. By not following God and introducing into his own definition something less than God, man predisposes himself to despair and homelessness in being because there is nothing in being that gives man a dwelling place and the comfort of reciprocity.

However, as the Bible teaches us, the invitation to communion with God, in order to ease the feeling of despair and anxiety, does not find a straightforward response in man: it represents an existential difficulty, because communion transcends the limits of the empirical, which is accessible to the senses and logical thinking. Certainly, there always was a temptation to treat the idea of communion as an abstract ethical ideal leading to a sort of religious humanism. In reality, this invitation to communion never implied any abstract teaching on how to answer basic questions, previously quoted from Kant. It implied to see God in creation and hence to be in communion with him. This 'did not prevent men from wallowing in error',[26] so that the invitation to communion, not recognised by men, was reactivated through the descent of God towards man when God assumed reality of the human flesh. This became God's self-response to his longstanding invitation to men to be in communion.

On the one hand, God's descent to the poverty and miserableness of the human condition, entering into friendship with the wicked and sinful, brought nothing new to man in terms of his own explanation. The vulnerable condition of the human affairs in the world with all horror and atrocities of humans with respect to themselves was not explained away and healed away. Christ himself, by being crucified and passing through the brutal attitude of humans to humans, did not imply that he was teaching them from the Cross 'what *is man*'. He did not attempt to teach of man along the lines of the Greek ideal of beauty and kindness. He rather confirmed to them through his witness to the Father that they 'do not know what they do' (Lk 23:34). By rephrasing a response to the Kantian question, Christ demonstrated to man that without receiving Christ as the Son God, and as the Son of Man, 'man does not know what to do, and what to hope for, he cannot avoid despair and uncertainty of not being able to approach the mystery of the his existence'. Through his parables,

[26] Athanasius, *On the Incarnation* 14 [ET: (Crestwood: St Vladimir's Seminary Press, 1996), 42].

Christ inaugurated the Kingdom of God, which was available to all, not only to those ideal men of the Greek philosophy. For anxiety and despair, groundlessness and non-attunement to the world, expressed through the paradox (as an implicit longing for immortality), can be healed in man himself only through abandoning the idea of finding his own foundation in that 'substance' of the world, which, in spite of being created by God, is yet in a state of indifference to man and his affairs, a state described above as a primary 'evil'.[27] Being a creature, man cannot receive any hope of elucidating his condition from a creature that is not hypostatic. However, man can confess unconditional love by imitating God, who created the world with no hope of reciprocal love from the world. But to exercise such a love, man ought to follow his archetype through God's promise of being in communion with man. In this sense, the Kantian questions received practical (not abstract philosophical) answers explicating the sense of the offered communion: As an image of God, man cannot *know* himself. He can know things of the world only in the delimiters of his own unknowability. Correspondingly, to avoid the anxiety of this unknowability, man *ought* to follow Christ (= to be in history) in order to see the world through 'his eyes', where the chasm between the uncreated and created was removed through the Incarnation of the Son 'begotten before all ages'. Man may only in this case *hope* for the union with God in his Kingdom, but without explication of the miracle of its own creation. Communion thus becomes such a change in the *tropos* (the way) of existence, when the world loses its sense of a hostile terrain and the source of 'evil'.

Christ, being fully human, experienced the same predicaments as all created men, but unlike all men, he knew that coping with these predicaments proceeded from his being the Son of God. The Son of God enhypostasised himself in the conditions of the physical world and, being fully human, he knew what it meant to be a creature and he transferred knowledge of this to humanity. The key point to the manifestation of Christ's creaturehood was his Crucifixion that showed the whole scale tragedy of being subjected to the law of death. The way to be 'man in communion with God' is to follow Christ through his life in the created human condition and comprehending the whole universe through his Incarnation, Crucifixion, Resurrection, Ascension, and ever being on the right hand of the Father. The major point here is experience of being created in the conditions of communion, or to be chained to the physical world whilst longing for freedom from the conditioned on the grounds of man's archetype in Christ. Thus, the human predicament expressed in the paradox of subjectivity receives its elucidation from the Christ-event, being the only possible theological reference in the hermeneutics of the ambivalent created condition of humanity.

In spite of Christ's moral teaching through centuries of the recent history, the Incarnation of God is not an accidental event that happened in order to heal human faults (for example, human inability to see the creator through creation,[28] thus not

[27] Yannaras, *The Enigma of Evil*, 16.
[28] See, for example, Athanasius, *On the Incarnation*, 3:11, 12.

following God). As that part of creation envisioned by God from the beginning, the human predicament of ambivalent existence in the universe was implanted in the very logic of creation by confirming once again that the main delimiter in answering the question 'What is man?' proceeds from his creaturehood. Man cannot answer the question 'What is man?' because he cannot create himself. By understanding this, he is predisposed to communion and acquisition of grace that confirms that man is not only a natural being, but a Divine image.

And it is through science, which is a particular modus of the Divine image in man, that man understands the dimensions of his created condition not from the side of the negative connotations of the paradox of subjectivity, but, in fact, related to the whole logic of creation. It is science that makes it possible to understand that it is the descent of God into the universe that predetermines the contingent facticity of the universe that accommodates man. For the Word-Logos of God to assume human flesh, there *must be* this flesh. Since modern physics and biology are clear with respect to the necessary conditions of existence for such flesh requiring at least ten billion years of cosmological evolution, it seems evident that for the Incarnation to take place the *necessary* physical conditions must have been fulfilled. To have a body of Christ and his Mother (Virgin Mary), the universe must have had from the beginning the propensity to produce them. Correspondingly, the ontological aspect of the Incarnation is always present in the reversed history of the universe as it is described in modern cosmology.[29] According to T. Torrance, the whole surrounding world, being created *freely* in an act of Love between the Persons of the Holy Trinity, exhibits *contingent necessity* related to its physical structure, its space and temporal span, encoding the motive of the Incarnation (and hence man) in the fabric of creation.[30] These observations change a stance on the position of man in the cosmos, releasing him from the mediocrity and insignificance of his physical existence. The question 'What is man?' receives its elucidation through the adoption of a new vision that the very existence of man was 'implanted' in the fabric of creation, whose logic presupposes bringing creation to communion with God through man. If the motive of the Incarnation is linked to the logic of creation, man as a particular segment of creation becomes inextricably intertwined with the rest of creation. Since the actual historical Incarnation happened in the midst of the human subset of the universe (recapitulating the universe on the level of consubstantiality and epistemological acquisition), its proper sense can be directly related to the constitution and meaning of the cosmos, in which humanity itself is no longer positioned on the periphery of the created universe but in its centre as immanent intentionality of creation. However, one must not treat the Incarnation and the very existence of intelligent humanity as metaphysically predetermined in creation.

[29] These conditions are summarised in various versions of the Anthropic Principle (AP), which detects consubstantiality of the physical stuff of the universe and human corporeal beings.

[30] T. Torrance, *Divine and Contingent Order* (Edinburgh: T&T Clark, 1998).

One can only assert that indeed the logic of creation contained the *necessary* conditions for existence of intelligence and hence the Incarnation. The *sufficient* conditions for both human intelligence and the Incarnation can only be detected through the actual happening of the Incarnation, thus providing us with their transcendent references (*paradeigmata*). The *sufficient* conditions for the Incarnation are not part of the underlying ontology of the world and here the *revelational* aspect of the Incarnation that enters the discussion framed in terms of the inauguration of the Kingdom of God. This is to say that the Incarnation is not part of the *natural conditions* in the world. Even if the world was created by God in order to attain union with God, it is humanity that is granted the means of such an attainment through a special call. The possibility of such an attainment effectively contributes to the definition of man: only in communion with God man becomes 'himself'.[31] In this sense man, in spite of being consubstantial to the visible creation[32] and having solidarity with it, is a special creation whose essence requires *grace*, and the mechanism of acquiring this grace proceeds through the Incarnation. Then one can see that the proper theological input in the dialogue of theology with the sciences originates exactly in the archetypical predisposition (endowed by the incarnate Christ) of relating the visible universe to its transcendent foundation, given to humanity through the grace of the 'giver of life'.

If one generalises this, the dialogue between theology and science, as co-existence of different attitudes to the created world, has its archetype in the Incarnate Christ, for whom the predicament of the dialogue did not exist because this dialogue was Christ's own creation in the same sense as the world and its scientific exploration were created by him. The difference in attitude to the world (present in theology and science) was introduced by Christ in order to teach man about the *meaning of creaturehood in the conditions of communion with God*. Being in human flesh, Christ as the Logos-creator had to hold the image of the physically disjoint universe in one single consciousness as an intelligible (noetic) entity. Thus, the unity of the created world, being split in itself as the sensible and intelligible, becomes the pivotal indication of the sense of the created. This split in the representation of man by himself (as the composite unity of the empirical and intelligible) indicated in the paradox of subjectivity cascades towards the split between science and theology, pointing towards the fact that neither empirical nor theoretical knowledge of the universe can receive any justification for their contingent facticity if the ultimate source if this facticity is not sought in the logic of creation. Thus, the dialogue between theology

[31] As was expressed by J. Zizioulas, one cannot identify man through a syllogistic formula 'man=man', which, if one follows a philosophical logic, contains a pointer beyond itself towards the definition of man as 'man=man-in-communion-with-God' (J. Zizioulas, *Communion and Otherness* (London: T&T Clark, 2006), 248).

[32] According to modern cosmology, the human body, consisting of atoms, effectively interacts with only 4% of all matter in the universe, remaining de facto non-consubstantial to the remaining 96%, which allegedly consists of Dark Energy and Dark Matter.

and science can be treated as an outward manifestation of the radical createdness of humanity wrestling with its own incapacity to control its own ends, as well the ends of the world. It is not difficult to guess that such a dialogue is an open-ended enterprise, having no metaphysical accomplishment and hence having sense only as contributing to the infinite hermeneutics of the created human condition.

One can be tempted to link the unknowability of man by himself—and the paradox of subjectivity—not to the issue of creaturehood, but to the conditions of the Fall as if the ambivalence in the human condition formulated in the paradox proceeds from the loss of memory of 'all in all' (Eph. 4:6) in the post-lapsarian state. Correspondingly, the resolution of the paradox could be associated with reacquiring the state of the first man Adam. However, this cannot be true, because the first man was also created and his knowledge of 'all in all', implanted in his Divine likeness, did not guarantee him being able to reproduce himself in a manner he was created by God. The crucial moment in explicating man's unknowability is Christ who, by being God and fully human, elucidates to man the sense of man's created condition, the sense which, as such, was obscured by the Fall. The traditional link between the Fall and the Incarnation is that the latter is treated as a redeeming act of God towards saving the transgressing humanity. However, Orthodox theology points towards a connection between creation and the Incarnation, as being, *de facto*, a *necessary and sufficient* condition for the created to be brought to union with God. In other words, the motive of the Incarnation is linked to the aim of creation.[33] According to Maximus the Confessor, the creation of the world contained the goal for which all things were created: 'For it is for Christ, that is, for the Christic mystery, that all time and all that is in time has received in Christ its beginning and its end'.[34] It is in this sense that the motives of creation and the Incarnation are inextricably intertwined and this, theologically (and in addition to the cosmological findings), points to the fact that the phenomenon of man is intrinsically linked to the motive of creation. Man was created in the universe, and because of his createdness he experiences his Divine image through the unknowability and ambivalence of existence. From here one can conclude that *the dichotomy between theology and science is thus an inevitable characteristic of man's creaturehood, so that the sought reconciliation of theology and science is impossible in the human condition to the same extent as the overcoming of the ontological (not moral) division between creation and God in the process of deification*.

By linking the motive of the Incarnation to the intrinsic logic of creation of the world by God, Orthodox theology extends the scope of the Incarnation beyond

[33] According to G. Florovsky, 'An adequate answer to the "motive" of the Incarnation can be given only in the context of the general doctrine of Creation.' G. Florovsky, '*Cur Deus Homo?* The motive of the Incarnation', in *Creation and Redemption*, The collected works of Georges Florovsky , vol. III, (Belmont, Mass.: Nordland Publishing Company, 1976), 170.

[34] Maximus the Confessor, *Questions to Thalassius*, 60.

the opposition of Fall-Redemption towards a wider span of the plan of salvation as related to the deification of man and bringing the whole of creation to the union with God. The lesser arch of the Fall-Redemption becomes a tool in restoring the greater arch of Creation-Deification.[35] A famous phrase from Athanasius that God 'assumed humanity that we might be made God'[36] implies that humanity, being created, has the potential to be in union with God (not based in the natural laws related to creation). One can say more emphatically that a creaturely modus of existence becomes unavoidable for the very possibility of deification. Correspondingly, if God's plan 'consists in deification of the created world' (some parts of which imply salvation), the plausibility of the plan of deification is rooted in the fact that man is ontologically united with created nature. Man is the 'microcosm who resumes, condenses, recapitulates in himself the degrees of the created being and because of this he can know the universe from within'.[37] In this sense Orthodox theology links the Incarnation to humanity as that subset of the created universe that is capable of playing a mediating role in overcoming moral tensions between different parts of creation, creation, and God.[38] The mediation between moral divisions in creation explicates the sense of being created and the delimiters of deification: the union with God through these mediations does not remove the basic ontological difference (*diaphora*) between the world and God thus not removing the riddle of man, retaining his basic definition as being *a creature in communion* with God.

The reader may be puzzled by such a paradoxical situation: indeed if one talks about deification as the union with God, and deification is possible through the Incarnation, why man cannot achieve through this deification that state that was pertaining to Christ the Incarnate? The answer is: Christ hypostatically remained the Logos of God and was controlling his enhypostasisation in Jesus by being able to explicate his own human, that is created, nature. However, this is not given to man, so that the Incarnation remains an archetype of the human (Divine image/physical flesh = uncreated/created) predicament. At the same time, the Incarnation brings a kind of a *natural division* in our understanding of communion. According to Maximus the Confessor, the Incarnation brought the division in the temporal span of evolution of the universe onto two fundamentally different aeons: '…God wisely

[35] A. Louth, 'The place of *Theosis* in Orthodox theology', in *Partakes of the Divine Nature: The History and Development of Deification in the Christian Traditions*, M. J. Christensen and J. A. Wittung (Madison: Fairleigh Dickinson University Press), 34–35. The Incarnation 'showed us that this was why we were created, and that this was God's good purpose concerning us from before ages, a purpose which was realised through the introduction of another, newer mode' (Maximus the Confessor, *Ambigua*, PG 91:1097C [ET: *On Difficulties in the Church Fathers. The Ambigua*. Vol. 1., ed. and tr. N. Constas, Cambridge, Mass.: Harvard University Press, 2014, 131–33]), that is the entrance of 'the incorporeal and incorruptible and immaterial Word of God [into] our world' (Athanasius, *On the Incarnation*, 8 [ET: p. 33]).

[36] Athanasius, *On the Incarnation* 54 [ET: p. 93].

[37] O. Clément, 'Le sense de la terre' *Le Christ terre des vivants. Essais théologiques. spiritualite orientale*, no. 17, (Bégrolles-en-Mauges: Abbaye de Bellfontaine, 1976), 90.

[38] See, for example, L. Thunberg, *Microcosm and Mediator: The Theological Anthropology of Maximus the Confessor* (Chicago: Open Court, 1995), 387–427.

divided "the ages" between those intended for God to become human, and those intended for humanity to become divine'.[39] This excludes a possibility of treating the movement from creation to deification through the Incarnation as a 'natural process' inherent in the fabric of creation. On the one hand, created things participate in God through the fact of their existence; that is, through 'being in communion'. However, when Maximus enquires about the human capacity of deification, he stresses that it does not belong to man's natural capacity.[40] By separating the aeons before and after the Incarnation, Maximus differentiates between the participation in God that is bestowed on man by creation and the participation that is bestowed by deification. Said differently, the aeon after the Incarnation corresponds to the movement of man to God, whose very possibility was effected by the Incarnation, and whose actual exercise demands not only *communion through existence*, but *communion through grace*. Grace is not implanted in the natural conditions of existence but is bestowed by God on the grounds of man's personal extent of perfection. It is this grace that makes it possible for man to realise his ambivalence in the universe originating in creaturehood. It is this grace that makes it possible to enquire about the contingent facticity of the sciences thus initiating their dialogue with theology. It is this grace that makes theology possible as that constituent of knowledge that explicates the sense of the created humanity.

The Dialogue between Theology and Science as an Open-ended Hermeneutics of the Human Condition

The sciences implicitly articulate the outward sense of existence in communion (that is being created) through their very contingent facticity, that is through the fact that they are. The underlying foundation of the sciences is man, whose sense, nevertheless cannot be completely explicated either by the sciences or by philosophy. The sciences function in the conditions man's unknowability by himself. Theology encounters the sciences (and philosophy) in order to release man from an intellectual impasse of unknowability and to invite him to learn from his archetype in Christ that—in spite of his creaturehood—he remains in communion and has a potential to achieve the union with God for the sake of understanding that the unknowability and paradox remain the basic theological delimiters in man's self-awareness of his creaturehood.

The duality in the hermeneutics of the subject, transpiring through the dialogue between theology and science, originates in the basic feature of man related to his creaturehood: man exists in communion with God by the fact of his createdness, but he does not 'possess' himself entirely in the world even in tendency because

[39] Maximus the Confessor, *Ad Talassium* 22 [ET: P. M. Blowers, R. L. Wilken, *On the cosmic mystery of Christ* (Crestwood: St. Vladimir's Seminary Press, 2003), 115].

[40] Maximus the Confessor, *Ambigua 20*.

the conditions of *communion through grace* are not part of the world. Indeed, by detecting his ambivalent position in the world (the paradox of subjectivity), man discovers himself in the conditions of an intellectual impasse: that is, the incapacity to understand the contingent facticity of such a paradox as the delimiter of his embodied consciousness. Through attempts to find the metaphysical grounds for himself, man produces instead an infinite hermeneutics of his own predicament thus sensing that the very means of interrogation of himself by himself cannot be existentially clarified. Here, an inerasable Divine image in man invokes the latter to seek God's help and thus following God, that God who once descended in the world to teach man about his creaturehood in order to be deified.

The dialogue between theology and science represents an open-ended hermeneutics of the created human condition. The discourse of the paradox of subjectivity provides the delimiters for any of such hermeneutics. Since the riddle of unknowability of man by himself cannot be resolved in terms of metaphysical concepts, cascading down towards the irresolvable nature of the paradox, the dialogue between science and theology cannot hope to have any material goal as its accomplishment. The moral tension between man's created condition and his Divine image, as well as a capacity to receive the grace of deification, will keep the dialogue active and alive—always and forever—just confirming a simple existential truth that both science and theology originate in one and the same man, created in communion with God, but living in a moral tension between the sense of man's created limitedness and his graceful longing for the unconditional and immortal.

Actor-Network Theory and Byzantine Philosophy

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The text offers a detailed reflection on the results of almost 20 years of work focusing on the paradigm of Actor-Network-Theory (ANT), including the application of concepts and methods inherent in Byzantine philosophy. The motivation for such reflection is based on the opportunity to expand and systematize latest research insights on the same topic by Ivan Chalakov and Stoyan Tanev. The starting point is the attempt to unfold the sociological explanations of phenomena such as endurance, resistance and innovation, which are difficult to explain through the paradigms of classical sociology. The suggested analysis adopts concepts such as essence-power-energy, hexis, perichōrēsis, hypostasis, prosōpon and body, to refine some of the positions characteristic of the ANT paradigm and propose new ones that allow to problematize the principle of symmetry, the understating of initiative, essence and the figure of the actor. The developed point of view is demonstrated by analyzing some of the paradoxes inherent in the understanding of the human hypostasis and the questions emerging from the theoretical prescriptions of transhumanism.

Introduction

Actor-Network-Theory (ANT) was articulated in the 1970s by Bruno Latour, Michel Callon, and their followers. It abandoned the 'Cartesian' subject-object scheme and challenged the existing sociological concepts of activity. Its emphasis is on the network interactivity between human and non-human beings. At the very beginning of the twenty-first century, Ivan Tchalakov and I initiated a research project focusing on exploring the ANT paradigm with a focus on social phenomena that were, in fact, unexplained by sociology at that time, such as endurance, persistence, resistance, and innovation. The key elements of our theoretical apparatus were based on the teachings and concepts of Byzantine philosophers. These concepts are: essence-power-energy, *hexis, perichōrēsis, hypostasis, prosōpon*, body. The results of our research problematized (by questioning the existing typology of social actions) the ANT concept of 'translation', which is used by ANT scholars as a replacement of the concept of 'action', and relativized the idea of 'symmetry', which is absolutized by the representatives of ANT. The application of the Byzantine conceptual apparatus opened new horizons, helped articulating new problems and challenges, opened new perspectives, as well as made it possible to refine and deepen the focus of the research project.

It has been over 15 years since my colleague Ivan Tchalakov introduced me to the ANT paradigm. He started with the intuition that certain concepts of Aristotle correspond to the core themes of this paradigm and could deepen them. His proposal came at a time of intense 'Byzantine' reading of Aristotle on my part. ANT has attracted me, most notably by its distancing from the ratio-centric and anthropocentric scheme of the subject-object divide as well as from the reification of both relationships and activities. What was essential for me was the opportunity to view the world as an interactive network that is dynamically established by human and non-human beings.

We presented the results of our joint work in three texts.[1] In 2013, together with Martin Roussel, we organized the conference 'Le Sujet de l'Acteur conference. An Anthropological Outlook on Actor-Network Theory' (June 5–6, Cologne, Germany) and published a book with the same title.[2] After the conference I decided that my article in the book[3] summarized all my searching and discoveries dedicated to the ANT paradigm. The provocation for a new recapitulation of my ideas came from two publications. The first one is the article by Stoyan Tanev, published in the same conference book.[4] The second one is the last chapter in Ivan Tchalakov's remarkable book (2015), entitled 'Instead of Conclusion: Georgi Kapriev on the Interpretation of Aristotle's Theory of Action in Byzantine Philosophy as an Alternative to the Notion of "Translation" in Actor-Network Theory'.[5] The specific occasion to write the present text was the kind invitation to contribute to this issue of *Analogia*, which came from Stoyan Tanev. I will therefore follow the order of the conceptual nuclei such as fixed by Tanev and Tchalakov. There will inevitably be some repetition of topics and ideas from previous publications to which new ideas will be added. And one last caveat: even though Tchalakov has generously presented some of the positions in his book as entirely mine, their articulation would not have been possible without his help in introducing me to ANT and our joint work on unfolding these positions in ANT's specific context. Therefore, I will speak in the first person plural: not 'I' but 'we'.

[1] Ivan Tchalakov, Georgi Kapriev, 'The Limits of Causal Action: Actor-Network Theory Notion of Translation and Aristotle's Notion of Action', *Yearbook of the Institute for Advanced Studies on Science, Technology and Society*, eds. Arno Bammé, Günter Getzinger, Bernhard Wieser, 47 (2005) (München – Wien: Profil, 2005), 389–433; Иван Чалъков, Георги Каприев, 'Социология на промяната и претърпяването', *Минало и съвремие: 60 години след Иван Хаджийски*, съст. Велина Топалова, Веска Кожухарова (Троян: ВГС, 2007), 63–83; Georgi Kapriev, Ivan Tchalakov, 'Actor-Network Theory and Byzantine Interpretation of Aristotle's Theory of Action: Three Points of Possible Dialogue', *Yearbook of the Institute for Advanced Studies on Science, Technology and Society*, eds. Arno Bammé, Günter Getzinger, Bernhard Wieser, 57 (2009), (München – Wien: Profil, 2009), 207–238.

[2] *Le sujet de l'acteur. An Anthropological Outlook on Actor-Network Theory*, eds. Georgi Kapriev, Martin Roussel, Ivan Tchalakov (Paderborn: Wilhelm Fink Verlag, 2014).

[3] Georgi Kapriev, 'The Byzantine Trace', *Le sujet de l'acteur* (cf. n. 2), 133–143.

[4] Stoyan Tanev, 'Actor-Network vs Activity Theory. Dealing With the Changing Nature of the Asymmetry in Human-Technology Inter-Actions', *Le sujet de l'acteur* (cf. n. 2), 65–85.

[5] Иван Чалъков, *За предприемачеството и устояването в науката: социология на лабораторния живот* (София: Изток-Запад, 2015), 181–194.

But first, I think, I have to explain what I mean by 'Byzantine philosophy'.

1. What do I mean by "Byzantine Philosophy"?

I have never been willing to impart an essential character to philosophy in general, neither to my interpretation of philosophy in Byzantium, nor to attribute to it some kind of monolithic form, immutability, or unequivocal continuity. On the contrary, I actually agree with the claim about the existence of 'the many faces of Byzantine philosophy'.[6] In the heterogeneous network of these multiple faces my interest has mostly focused on speculative and discursive philosophy; my subject is the rational and rationalist discourse in the Byzantine tradition: philosophy as investigation of the logos of being qua being.

From this perspective, when I speak of 'philosophy in Byzantium', I usually mean the conglomerate of all philosophical projects in Byzantine culture. In contrast, by 'Byzantine philosophy' I mean those philosophical tendencies that set themselves apart from the Western traditions, mainly by making a particular emphasis on the dynamics of being and by interpreting the structures of being as networks of multiple dynamic layers. These tendencies do not bring to the fore the essence, substance, or whatever is in itself, but rather emphasize its actuality, its actions, and its motions, i.e. its existence through which an essence comes to be known. It is this peculiar nuance, added to the mainstream set of metaphysical problems, that I consider a unique contribution of Byzantium's philosophical culture.[7]

It is in this context that I should briefly discuss the question about the relation between theology and philosophy. Photius of Constantinople is probably the first to explicitly distinguish between theology as a mystical experience and the discursive theology on which that experience is based. Photius introduces expressions such as *καθ' ἡμᾶς θεολογία or ἡ ἡμῶν θεολογία*,[8] used until then solely in the context of philosophy and not applicable to theology, understood as a theological experience and self-expression of God. That is the way Photius calls the speculative theological teachings, referring to *διδασκαλία* and *μάθεσις* that are inspired by the Divine words and thus based on the contemplation of the supernatural.[9] He describes speculative philosophy as the highest possible theoretical knowledge as well as part of the first philosophy in which it takes on the role of the most sublime metaphysical reflection. These definitions of Photius remain valid for all representatives of the Byzantine

[6] Katerina Ierodiakonou, 'Byzantine Philosophy Revisited (a decade after)', *The Many Faces of Byzantine Philosophy*, eds. Börje Bydén, Katerina Ierodiakonou (Athens: The Norwegian Institute at *Athens*, 2012), 1–21.

[7] Cf. Georgi Kapriev, 'Philosophy in Byzantium and Byzantine Philosophy', *The Ways of Byzantine Philosophy*, ed. Mikonja Knežević (Alhambra, California: Sebastian Press, 2015), 1–8; Georgi Kapriev, 'Was hat die Philosophie mit der Theologie zu tun? Der Fall Byzanz', *Byzantine Theology and its Philosophical Background*, eds. Antonio Rigo, Pavel Ermilov, Michele Trizio (Turnhout: Brepols, 2011), 4–16.

[8] Photios, 'Amphilochiae', 182 (PG 896C:897D).

[9] Ibid., 190, 4 (920C).

tradition after him, independent of their anthropocentric and theocentric lines of thought.

2. Key points in the reception of our position (Tchalakov & Kapriev, 2004)

The first text that Tchalakov and I published in October 2004 begins with the sentence: 'In this paper, we want to discuss the sociological concept of activity seen in terms of change, innovation, and the closely related aspect of "suffering"—the endurance and overcoming of resistance, the external and internal pressures that it is usually accompanied by'. Our main motivation was to re-examine the highly neglected phenomena of resistance, suffering, and endurance by enhancing the ANT approach with the tools and resources of Byzantine philosophy.

The unfolding of our position has helped to emphasize two points that were perceived as 'dissident' in view of ANT's basic presuppositions. On the one hand, this was our proposal for an alternative of the concept of 'translation' in ANT. On the other hand, this is the reintroduction, on a new, non-Cartesian basis, of the asymmetry between actors (with the main example of an existing asymmetry in the interplay between human and non-human actors), which was acknowledged as a distinctive scholarly contribution.[10]

Seeking a way out of the aporias inherited from the sociological conceptions of 'social action' at that time, the ANT promoters broaden the concept to the maximum and adopt a pluralistic approach to it, abandoning any hierarchical or genealogical procedures in its definition and explanation. At the same time, they pay particular attention to the activity of the so-called non-human agents (things other living beings or technical objects). This is how concepts such as 'regimes of action' or 'heterogeneous networks' of human and non-human actors emerge, going beyond the traditional distinction between the natural and the social. Hence the emergence of the term 'translation', whose 'extension' enables us to refer to anything endowed with the capacity to act. The term refers to the actions of both human and non-human actors in heterogeneous networks and allows ANT representatives to develop a symmetrical approach in their study. Any translation can modify, transform, challenge, or support previous translations.[11] Society and nature fluctuate similarly to the networks that connect them.

Looking at specific analyses performed from an ANT perspective, however, we can see that they do not challenge the nature of social action as an entirely object-oriented action. There can be no action without an object, so that every action has its 'in order to', i.e., putting a concrete objective goal, whence it follows that every action is characterized by fixed goal-mediation. After the twelfth century,

[10] Tanev, 'Actor-Network vs Activity Theory' (cf. n. 4), 82.

[11] Cf. Michel Callon, 'Four Models for the Dynamics of Science', *Handbook of science and technology studies*, eds. Sheila Jasanoff et alii (London: Sage, 1996), 50.

Western European philosophy and social science inherited an interpretation of Book IX of Aristotle's Metaphysics, according to which action is ultimately reduced to the type of causal actions (which Aristotle calls 'motions having a limit'[12]). This specific reduction makes it so easy to replace traditional sociological concepts of activity with the concept of translation in ANT—it captures the commonalities between human and non-human actors as capable of causing movements, influences and impacts in heterogeneous networks. Thus, sociological descriptions continue to ignore an entire class of activities, including different forms of bodily behavior, including those empirically identifiable but inexplicable 'deviations' from the norms, as well as any exercised opportunities to ignore such norms, which are usually considered within the limits of sociological error. Our perspective opens the horizon to considering the 'heterogeneous coupling' between human and non-human actors as a kind of relationship that goes beyond the concept of translation. It enables the development of methods for observing and recording the 'dual' nature of activity—finding techniques that capture the 'hypostaticity' of the actors under study and then separate the 'noise' of causal actions from the manifestations of specific existential actions, which are parallel to the causal ones and are usually seen as their 'insignificant' aspect.[13]

A central methodological moment for Latour is the annihilation of any *a priori* difference between social and non-social factors, actors, or agents. This is one of the key aspects of the ANT symmetry principle. Objects should be included as equally present in and relevant to the course of action; they have equal rights with respect to other subjects involved in the course of action. In this sense symmetry was the 'most important philosophical discovery' in ANT[14].

The concept of 'asymmetry' that was introduced by Tchalakov and me was understood at first quite incorrectly. It does not at all assume the pre-existence of a privileged and ontologized subject of action. The reason for introducing our asymmetry concept is the fact that in every practical situation there is someone or something that is the first in initiating a change and, by being first, this someone or something is in a stronger position to predefine the specific situational dynamics of the particular change. We were referring to the asymmetry emerging from the possibility for different actor-networks to take specific initiatives in different situations or contexts and in different moments of time. If you consider the social connections in the specific case of a wall, a nail, a hammer and someone using the hammer to put the nail in the wall, you can clearly imagine the changes of initiative in this micro-social situation.

[12] Aristotle, Metaphysics, IX, 6, 1048b18–30.

[13] Чалъков, *За предприемачеството и устояването в науката* (cf. n. 5), 183–184 and 194.

[14] Bruno Latour, 'One Turn After the Social Turn', *The Social Dimensions of Science*, ed. Ernan McMullin (Notre Dame, Ind.: Notre Dame Press, 1992), 272–294; Tanev, 'Actor-Network vs Activity Theory' (cf. n. 4), 65–66 and 73.

Bruno Latour and most of the ANT authorities do not like the term 'initiative'. They associate it with the actor as 'a source of initiative or a starting point, the extremity of a vector oriented toward some other end'.[15] At the same time Latour insists that 'ANT is not […] establishment of some absurd "symmetry between humans and non-humans"'. He explains: 'To be symmetric, for us, simply means not to impose *a priori* some spurious asymmetry among human intentional action and a material world of causal relations'.[16] I should point again out that we (Tchalakov and I) do not believe in such type of apriority either. Another one of Latour's questions is: 'How long can a social connection be followed without objects taking the relay?'[17] Well, the asymmetry we are talking about consists exactly of the 'taking the relay' in every possible moment of a specific 'social connection', independent of who is the actor or the actor-network taking the relay. The important point here is that the two aspects are equally applicable to both human and non-human agents. We think of all these agents not necessarily as persons but as hypostases.

The other dimension of our concept of asymmetry arises from the hypostatic factor as an aspect in distinguishing between different actors, without ascribing an unconditional priority to the human actor as a Cartesian subject. The axis of rotation here is that every being—both human and non-human—possesses both specific natural properties and unique hypostatic properties. This asymmetric aspect is based on the hypostatic and natural specificity of the manifestation of the activities, which also predefines the way a specific change will be actualized. At this point the subject of the asymmetry should be discussed in addition to the situational initiative to emphasize the meaning of 'asymmetry', which results from the specificity of the essence and the corresponding energy of the respective actor.

The idea was borrowed from the 'Christological asymmetry' articulated by Georges Florovsky, whose starting point was the initial non-hypostatic status of the human nature in Christ.[18] In Florovsky's case the notion of asymmetry emphasizes the fact that the process of *περιχώρησις* is initiated by the Divinity in a way that the Divine action enables the opportunity for human nature to acquire the real possibility to inter-penetrate or co-inhere with the Divine nature. It does not mean and does not lead to a radical dominance of the Divine nature. It means the existence of a specific kind of dialogical reciprocity (a term introduced by N. Loudovikos) within the context of the co-inherence of the Divine and human natures. Both the problematization of the term 'translation' and the concept of asymmetry arise as a consequence of the concretization of the method, which is achieved not least by

[15] Bruno Latour, *Reassembling the Social: an Introduction to the Actor-Network-Theory* (Oxford, UK – New York: Oxford University Press, 2005), 216.

[16] Ibid., 76.

[17] Ibid., 78.

[18] Георгий Флоровский, *Восточные отцы V–VIII веков* (Париж: YMKA Press, 1933) (repr. Москва, 1992), 26.

virtue of the Byzantine conceptual apparatus when applied in the context of the paradigm of ANT.

3. The two-fold nature of action

The first step in the introduction of this conceptual apparatus is the note of the semantic stem of two words routinely accepted as synonyms: the Latin *res* and the Greek *πρᾶγμα*. They are both translated as 'something', 'object', 'thing', but are not actually unequivocally identical. While *res* suggests mainly objective or substantial detachment, *πρᾶγμα* means above all 'deed', 'something actual', 'active', 'exercising influence', 'achieved', lat. *facinus*. *Πρᾶγμα* is the available concretum of the abstractum *πρᾶξις* (practice) referring to a given subject (when there is a subject). While *res* (abstractum: *realitas*, reality) underlies a vision of the world based on static self-determination, *πρᾶγμα* describes a world founded on dynamic interactions. While the Latin tradition in principle perceives reality through the subjectively stable *res*, the starting point for the Byzantine tradition is activity or, to use the Greek word – *ἐνέργεια*. The Byzantines perceive reality as actuality. The course of action of any agency, be it human or non-human, could in principle be described by means of two major types of actions: 'causal actions' and 'existential actions.' Paradigmatically, this difference is founded in Aristotle's *Metaphysics* and its Hellenic and Byzantine interpretations.

In book IX of *Metaphysics* Aristotle distinguishes between the ways of speaking about the essence (*οὐσία*) of every being through the categories and through the concepts of force (*δύναμις*) and action (*ἐνέργεια*).[19] Both Latin and contemporary translations tend to express the dyad *δύναμις-ἐνέργεια* as *potentia-actus* and, very often, as *possibilitas-actualitas*. Such translations tend to associate the meaning of the signified with modal terms, which obscures the original Aristotelian intentions. Aristotle defines the force-*δύναμις* as exercising influence on something else and of undergoing influence from something else. The capacity of every force to influence is called *ἐνέργεια* (energy/action), which is defined firstly as *κίνησις*/movement. Aristotle subsequently distinguishes between two kinds of actions: movements and energies par excellence.[20] The movements have a beginning and an end; they have a limit (*πέρας*), but they do not have an ultimate *τέλος*/purpose. They are actions initiated by a certain external cause and cease when the cause is no longer present. We can call the movement's causal or instrumental actions.

The energies *par excellence* have a τέλος and are identical with the existence of the being / *τὸ ὑπάρχειν τὸ πρᾶγμα*. This is the manifestation of the essence and its force, which is bound to the ultimate purpose of the essence. That is why Aristotle

[19] Aristotle, Metaphysics IX, 1, 1045b32–1046a2.
[20] Met. IX, 3, 1046b29–1047b2; IX, 8, 1049b8–10.

identifies the energy with the entelechy / *ἐντελέχεια*.[21] The energy provides the definiteness of the life.[22] The energy is the existential action of the essence, but the energy does not have a substantial character. This type of energy can be defined as existential. It should be noted that the essence coincides with its essential energy in just one specific aspect. They are one and the same, but the essence carries the energy. For its part, the energy is not essence; it belongs to the essence. It is its existential action. The energy is the existence of essence and its manifestation. It is not generated by some immediate 'in order to,' but pursues the purpose of existence as such rather than some contingent goal set up by whatever circumstances in life. This energy is the real existence of an essence.

The network of energetic activities forms the reality of being and, in this sense, it is really actual or active. Typologically speaking, the network is 'woven' by two types of activities: activities and practices which have a limit; activities that are boundless but have a pre-defined purpose. The theme is further developed by Aristotle in the Nicomachean Ethics (X, 3–4) and in the representation of the unmoved mover (Met. XII, 7). David Bradshaw illustrates the general differences between the two types in a helpful scheme:[23]

κινήσεις (***movement, causal action***)	**ἐνέργεια** (***existential action***)
1. Has a termination.	1. Has no termination.
2. Is not an end but for the sake of an end.	2. Is an end or has end within it.
3. Complete when it achieves what it aims at, i.e., during whole time or at final moment.	3. Complete at any moment because it does not lack anything that, coming into being later, will complete its form.
4. Must cease before perfect tense can apply.	4. Present and perfect tense apply simultaneously.
5. Has parts that are different in kind from one another and from the whole; the 'whence' and the 'whither' give them their form.	5. Homogeneous.
6. Occurs quickly or slowly.	6. Does not occur quickly or slowly.
7. In time.	7. In 'the now'.

In all the historically realized forms of Aristotle's philosophical reception in the Western tradition, this semantic layer of being is missing, or at least significantly neglected. There is, however, one notable exception. In his lectures in 1931/32, through a careful reading of book IX of Aristotle's Metaphysics, Martin Heidegger shows that the usual common translation of *δύναμις* and *ἐνέργεια* as 'potentiality' and

[21] Met. IX, 6, 1048b22; IX, 8, 1050a7–10.
[22] Met. IX, 8, 1050b1–2.
[23] David Bradshaw, *Aristotle East and West: Metaphysics and the Division of Christendom* (Cambridge: Cambridge University Press, 2004), 10.

'actuality' does not adequately reproduce the Aristotelian intention because the two terms are considered to belong to the modal categories. For Aristotle, the question of *δύναμις* and *ἐνέργεια* is not a question related to the categories but to being as such.[24] It is about the power and activity of being itself.[25] Power in the proper sense of the word is understood not categorically, but as the basic mode of being: being and non-being in the sense of the bearable (*δυνατόν*) and the unbearable (*ἀδύνατον*), respectively, of the powerful and the powerless. Power is the ability, the power, the quality of being able, which manifests the different types of being able.[26]

Heidegger repeatedly emphasizes the Aristotelian distinction between *δύναμις κατὰ κίνησιν* and δύναμις *par excellence* (*δύναμις ἐπὶ πλέον*) but does not elaborate in greater detail on the second theme. *Δύναμις κατὰ κίνησιν* is defined as '*Leistenkönnen*' and *ἐνέργεια κατὰ κίνησιν* is, respectively, achievement-oriented activity. The energies are what is accessible in actuality ('*das handgreiflich Wirkliche*').[27] It is emphasized that the way of explaining the origin of the concept of power, based on the data of subjective experience, is not only inadequate but also capable of misplacing the whole question in a direction that will definitively detach it from the real problem.[28] *Δύναμις* is interpreted as *ἀρχή* (origin, principle), as something from which something else originates: *πρώτη δύναμις* / first force is the fundamental definition of an essence.[29]

Ἐνεργεῖν, in turn, means being in action (not just being real or actual).[30] To observe powers and energies is to look at the constitution of the being of respective beings as such.[31] They are considered to belong to the existential character of a being and contribute to the making of its constitution.[32] From this horizon, Heidegger attacks 'the seeming self-understanding of causality'.[33] In Aristotle we encounter the forces not in terms of their causal relation as causes; a force is not a 'concept derived from causality'.[34] There is still no relationship between cause and effect.[35] Heidegger concluded the lecture by saying that Aristotle's theory represents the philosophical knowledge of antiquity, 'a knowledge that is still underestimated and misunderstood in today's philosophy'.[36] Heidegger's way of thinking on this subject did not gain popularity in Western scholarship.

[24] Martin Heidegger, 'Aristoteles, Metaphysik Θ, 1–5, Von Wesen und Wirklichkeit der Kraft', Martin Heidegger, *Gesamtausgabe*, Bd. 33 (Frankfurt am Main: Vittorio Klostermann, 1990), 9.
[25] Ibid., 50.
[26] Ibid., 65.
[27] Ibid., 78.
[28] Ibid., 74.
[29] Ibid., 78 and 90.
[30] Ibid., 167.
[31] Ibid., 120.
[32] Ibid., 117.
[33] Ibid., 77.
[34] Ibid., 79.
[35] Ibid., 83.
[36] Ibid., 219.

The Aristotelian theme continues, however, in its Greek-speaking pagan Neoplatonic reception. It distinguishes between energy that is inherent in the essence and energy that is directed outwards from the essence, accepting that the essence can be known only through its energies. It recognizes that beings can participate in each other through their energies and the participation is interpreted as synergy. It distinguishes between eternal and temporal energies (depending on the nature and status of the essences) and accepts the existence of beings possessing both eternal and temporal energies (human souls in particular).

The Byzantine tradition considers essence/*οὐσία* and nature/*φύσις* as identical and interprets them as the common form of a specific being that is represented in multiple individuals. However, the truly authentic manifestation of each essence, either finite or infinite, is in its constitutive force (*συστατικὴ δύναμις*) and natural energy (*φυσικὴ ἐνέργεια*). It is impossible, points out Maximus the Confessor, to acknowledge an essence and, at the same time, reject its constitutive energy. Every essence has its moving force in itself (it is *αὐτοκίνητος*) because it is expressed by its energy and it exists through its energy. The natural energy is the ultimate and most straightforward characteristic of the essence; a nature cannot exist without its constitutive movement.[37] It is its 'only and true demonstration (or: proof)' (*μόνη τε καὶ ἀληθής ἐστιν ἀπόδειξις*), because the essence (every essence, without exception) is in itself unknowable and subject to knowledge only through its power and energy.[38] The natural energy is the species forming motion, the most general of all properties, and without it, there is nothing, neither motion nor existence.[39]

Energy is the existential action of an essence: it is not the essence but is essential. Gregory Palamas describes energies in a way that was clear to his contemporaries: *πράγματα ἐστι κἂν οὐκ οὐσίαι*.[40] If an essence was void of energy that is distinguishable from the essence itself, he insists, then it would not be real (*ἀνυπόστατος*) and would be considered only mentally. 'Man in general' (*ὁ καθόλου ἄνθρωπος*) is entirely non-hypostatic (*ἀνυπόστατος*, not real). The being of the essential energy indicates that man is hypostatic (*ἐν ὑποστάσει*). This common standpoint pertains to every kind of nature.[41] Palamas refrained from qualifying the distinction of essence-energy by a logical technical vocabulary. The only two distinctions used from the time of the first Greek fathers to the time of Palamas—a *διαφορὰ τῷ πράγματι*/real distinc-

[37] Maximus Confessor, 'Ambigua ad Thomam', 5 (PG 91:1052B).

[38] Maximus elaborates on the thesis, which has been developed already by the Cappadocians, that in itself the essence of all things, including the uncreated ones, cannot be precisely or entirely known, but it is merely expressed thorough its properties (i.e., through its energies): Basilius Magnus, 'Homiliae IX in Hexaemeron', 1, 8 et 11 (PG 29:20C–21A; 25A–28B). Cf. Георгий Флоровский, *Восточные отцы V–VIII веков* (cf. n. 19), 70.

[39] Ibid., 1048A.

[40] Gregorius Palamas, 'Contra Gregoram', *Γρηγορίου Παλαμά Συγγράμματα*, τομ. 2, επιμ. Παναγιώτης Χρήστου (Θεσσαλονίκη: Κυρομάνος, 1966), 280, 29–30.

[41] Gregorius Palamas, '150 Capita', 136–137, *Γρηγορίου Παλαμά Συγγράμματα*, τομ. 5, επιμ. Παναγιώτης Χρήστου (Θεσσαλονίκη: Κυρομάνος, 1992), 112, 7–113, 6.

tion and a *διαφορὰ κατ᾽ ἐπίνοιαν*/rational distinction—could not render the difference between essence and essential energy correctly. First Georgios Scholarios in the Palamite tradition describes the energies as *τὶ το πράγματος καὶ ἐν τῷ πράγματι* (something belonging to the thing or present in the thing) and determines the distinction between essence and energy as *εἰδικὴ διαφορά* (i.e., as *distinctio formalis ex parte rei*) in the sense of the *distinctio*-formulas of Duns Scotus.[42]

4. The essence / nature

This theory of action is based on the notion of 'nature' identified in the Byzantine tradition with 'essence'. The essence or nature of a thing is never considered in itself, but rather as a source of energetic manifestations and dynamism. The variety of the natural attributes of a thing can be known only through its energies or actions. However, these two notions are used in a quite different manner in comparison to the philosophical lexicon of the Latin tradition, which forms the roots of modern philosophy and sociology.[43]

In developing his ideas, Latour refuses to accept the existence of any essence in the actors that moves from one action to another and in some sense precedes it. On the contrary, the actors and their characteristics are the result of an event that has already happened. As he points out in one of his important early works, 'everything only happens once and in one place'.[44] He later tells us that the actor is nothing more than what he modifies, transforms, changes, and creates.[45] If we remove one actor from one network and put him in another, he is no longer the same actor. Equivalence between the two can only be ascertained by an observer who can uncover the translation chain that creates the equivalence between the two actors. Not only has the original distinction between human and natural things been removed, but the very identity of human or non-human actors with themselves has been problematized.[46]

Since 2007, Antoine Enion has distanced himself from ANT's rejection of the presence of essences in the actors, which precede every action as an event.[47] Graham

[42] Cf. Georgi Kapriev, 'Gregory Palamas and George Scholarios: John Duns Scotus' Differentiation between Substance and Energy and the Sources of the Palamite Tradition', *Analogia: The Pemptousia Journal for Theological Studies*, 5 (2018): 35–56.

[43] Tanev, 'Actor-Network vs Activity Theory' (cf. n. 4), 76–77.

[44] Bruno Latour, *The Pasteurization of France*, transl. Alan Sheridan and John Law (Cambridge, MA – London: Harvard University Press, 1988), 162.

[45] Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge, MA: Harvard University Press, 1999), 122.

[46] Чалъков, *За предприемачеството и устояването в науката* (cf. n. 5), 27.

[47] Cf. Antoine Hennion, 'Those Things That Hold Us Together: Taste and Sociology', *Cultural Sociology* 1 (2007), 97–114; Antoine Hennion, 'A la recherche de l'objet perdu …?', *Les usages de la sociologies de l'art: constructions théoriques, cas pratiques,* eds. Sylvia Girel and Serge Proust (Paris: L'Harmattan, 2007), 25–42; Antoine Hennion, 'Affaires de goût. Se rendre sensible aux choses', *Sensibiliser. La sociologie dans le vif du monde*, eds. Michel Peroni et Jacques Roux (La Tour d'Aigues: Éditions de l'Aube, 2009), 161–174; Antoine Hennion, 'Réflexivités. L'activité de l'amateur', *Réseaux* 1 (2009): 55–78.

Harman pointed out in 2015 that in the world of Latour's scientific research, 'there is no place for the Aristotelian concept of substances that remain the same thing over time even as their accidences and attitudes change'.[48] Harman then published several papers praising ANT's achievements and Latour himself, but criticized exactly his anti-essentialism. Back in 2005, we also suggested a clear alternative pointing in the same direction. We outlined the opportunity to think about emerging actor-networks and interactions between human and non-human actors in them, with an emphasis on the concept of essence. It allowed us to maintain the asymmetry between actors without returning to the 'Cartesian' distinction between society and nature, and between consciousness and body.

We are actually aware of the resistance of many, including many actor-network theory proponents, against the concept of essence established in the West. We believe that such resistance is the result of a kind of terminological inertia that is typical of Modern Western philosophy and that tends to reduce the essence to a logico-epistemological abstractum—an essence understood as commonly and impersonally, but also 'really', present in each individual. This resistance has been clearly outlined by Karl Marx in his *Thesen über Feuerbach* of 1845. Obviously puzzled by the objectification of the cognitive abstraction of 'essence', Marx goes to the other extreme, effectively formulating a radically relational anthropology.[49]

Driven by an (understandable) nausea from the absurdity of such kinds of being Jean-Paul Sartre, for example, uses the terms 'essence' and 'nature' as referring to the actual 'image' or 'figure' of the Self. He is however also fully aware that by means of his or her potential capacities every human being is a human and not 'moss, mold or cauliflower'. This is why Sartre is forced to accept the existence of conditional human universality (*une universalité humaine de condition*). He prefers to speak of 'human condition' (*condition de l'homme*) instead of 'human nature' (*de sa nature*).

[48] Graham Harman, '3D Printing and Actor-Network Theory', *International Journal of Actor-Network Theory and Technological Innovation*, 1 (2015): 4.

[49] '5. Feuerbach, not satisfied with *abstract thinking*, wants sensuous contemplation; but he does not conceive sensuousness as *practical*, human-sensuous activity. 6. Feuerbach resolves the essence of religion into the essence *of man* [the human nature]. But the essence of man is no abstraction inherent in each single individual. In reality, it is the ensemble of the social relations. Feuerbach, who does not enter upon a criticism of this real essence is hence obliged: 1. To abstract from the historical process and to define the religious sentiment regarded by itself, and to presuppose an abstract – *isolated* – human individual. 2. The essence therefore can by him only be regarded as 'species', as an inner 'dumb' generality which unites many individuals in a *natural* way' – Karl Marx, *Theses on Feuerbach*, https://www.marxists.org/archive/marx/works/1845/theses/index.htm, accessed December 27, 2019 [with my corrections in the translation GK].

The German original version: '5. Feuerbach, mit dem *abstrakten Denken* nicht zufrieden, will die *Anschauung*; aber er faßt die Sinnlichkeit nicht als *praktische* menschlich-sinnliche Tätigkeit. 6. Feuerbach löst das religiöse Wesen in das *menschliche* Wesen auf. Aber das menschliche Wesen ist kein dem einzelnen Individuum inwohnendes Abstraktum. In seiner Wirklichkeit ist es das ensemble der gesellschaftlichen Verhältnisse. Feuerbach, der auf die Kritik dieses wirklichen Wesens nicht eingeht, ist daher gezwungen: 1. von dem geschichtlichen Verlauf zu abstrahieren und das religiöse Gemüt für sich zu fixieren, und ein abstrakt – *isoliert* – menschliches Individuum vorauszusetzen; 2. Das Wesen kann daher nur als „Gattung", als innere, stumme, die vielen Individuen *natürlich* verbindende Allgemeinheit gefaßt werden' – http://www.mlwerke.de/me/me03/me03_005.htm, acessed December 27, 2019.

This is 'the ensemble of the *a priori* boundaries drawing the fundamental human situation in the universe' (*l'ensemble des limites a priori qui esquissent sa situation fondamentale dans l'univers*). These boundaries are neither objective nor subjective but have both objective and subjective aspects. The existential human project aims at their redrawing and rearrangement, overcoming or adapting to them.[50]

One should also add that the drawing of these boundaries does not delimit an empty space but the actual human potentialities, which are realized and actualized through their activities. Interestingly, the Byzantine understanding of 'essence' and 'nature' could be described in a very similar way. (It is the general principle / *λόγος* of the being of things, expressed separately and in a unique way by the individual thing.) The Byzantine thinkers distinguish between 'nature contemplated in a species' (*ἐν τῷ εἴδει*) which is used to form the general concept of any given nature, and nature contemplated as existing in a specific individual (*ἐν ἀτόμῳ*). In the second case the nature is considered under the conditions of its actual existence. There is a difference between the two ways of seeing nature. For example, the living rational and mortal nature of a unique human being does not entirely overlap with the human nature of any other human being; it is characterized by its proper particularities and not the particularities of anybody else.[51] From the second point of view nature does not precede the different beings who are the carriers of its characteristics. The essence or nature of a thing is primarily a source of energetic manifestations.

5. The hypostasis

Following this line consistently, Byzantine thinkers have refined the conceptual apparatus. This refinement is necessitated by the fact that they faced a problem unknown to antiquity: the problem of personal salvation—not the fate of human nature, not of humanity, but of the individual. Crucial here is the concept of 'hypostasis' (*ὑπόστασις*).

'Individual' (*ἄτομον*) is identified with 'hypostasis' (and 'person'/ *πρόσωπον*) only insofar as the term denotes a particular being attached to an essence. The individual in his own sense is the singular representative of a species. The individual is someone or something that could still be divided, but after the division its original definition would be lost.[52] The individual signifies the distinction of the singular representatives of a species by number.[53] However, the numerical difference does not indicate uniqueness. When we talk about individuals, we ask the question 'what is

[50] Jean-Paul Sartre, *L'existentialisme est un humanisme*, http://www.danielmartin.eu/Textes/Existentialisme.htm, accessed December 27, 2019.

[51] Johannes Damascenus, 'De haeresibus' (PG 94:745B–748C). Cf. Johannes Damascenus, 'Expositio de fide orthodoxa' (PG 94:1021D–1024A).

[52] For example, the human individual is divisible further in body and soul, but none of these parts are the human being.

[53] Cf. Johannes Damascenus, 'Dialectica', 5; 11; 50 (PG 94:541CD; 573AB; 632A).

this?' and the answer refers to the name of the species whose singular representative is the individual. 'Individual' is a term that is much more connected with the natural than the hypostatic characteristics. Maximus the Confessor, defining precisely the concept of 'hypostatic difference' (*ὑποστατικὴ διαφορά*), correctly points out that the separation by number of things having the same essence determines the multiplicity of the individuals. [54] An abstract essence subsists not as identical but as similar at the level of the individuals of a species, and as a carrier of unique existence, a thing is understood not in the horizon of its individuality, but in terms of its hypostasis (which, of course, does not imply any ontological or axiological hiatus between the two dimensions – at long last, 'individual' is not a natural subject par excellence).

The Cappadocians regard the hypostasis as the unique realization of the common essence. This realization is characterized by its unique properties, in which the emphasis is not laid on the properties but on their agent. They are not perceived as accidences but as constituents of the specific being.[55] Maximus the Confessor carries on the tradition in bringing precision and insists that nature itself is accepted in the hypostasis because nature exists only when hypostasized. The mutual imminence of nature and hypostasis means that an essence comes into being through a hypostasis and only through it. The hypostasis is what realizes the energy of nature.[56] If we could think the essence as actuality, then we must think the hypostasis as actualization. When defining the concept of 'hypostasis', Maximus presents the two definitions formulated so far by tradition and views them as naturally combined: 'hypostasis' is what exists in itself and separately; at the same time, it is one essence in togetherness with properties that distinguish the specific hypostasis from the other hypostases of the same nature.[57] Besides this, he describes the hypostasis as an *acting subject* (*ἐνεργῶν*).[58] He especially underlines the irreducibility of the hypostatic order to the natural (essential) one.

In this context, Maximus states quite instructively:

> Each of us acts (*ἐνεργεῖ*) initially as something, that is, as a person. Acting as someone, for example Paul or Peter, he forms a (certain) mode of action (*τὸν τῆς ἐνεργείας τρόπον*), for example, by weakening or strengthening, forming himself in this way in accordance with his inner will (*κατὰ γνώμην*). It follows therefore that what is different in persons with regard to the mode of action is recognized through their activity (*πρᾶξις*), while the uniformity of natural action follows from the logos of nature.[59]

[54] Maximus Confessor, *Opuscula theologica et polemica* 14 (PG 91:152B).
[55] Cf. Basilius Magnus, 'Epistula XXXVIII', 2–3 (PG 32:325B–328C).
[56] Maximus Confessor, 'Opuscula theologica et polemica', 16 (PG 91:205AB; 26:260D–268A).
[57] Maximus Confessor, 'Epistulae' (PG 91:557D).
[58] Maximus Confessor, 'Opuscula theologica et polemica', 16 (PG 91:205BC).
[59] Maximus Confessor, 'Opuscula theologica et polemica', 10, (PG 91:137A).

Natural energy is the same in all individuals. It is the carrier of the form of the species. However, this form is being actualized hypostatically. This is what makes it possible to speak of natural energy in the plural.[60]

The hypostasis extrapolates the natural energy according to its hypostatic properties. The character and intensity of this extrapolation depend on the way the hypostasis exists and not on the existence of nature and because of this the hypostatic characteristics leave a strong imprint on the manifestation of energy. The existential action of a concrete hypostasis can be stronger or weaker, more dispersed or more concentrated; it can change its intensity and concentration in time. But the only thing that is certain is that the natural energy (existential action) can never be missing. And there is no principal difference when speaking of the hypostasis or the energies of rational or un-rational beings.

6. The hexis

If the hypostasis manifests specifically natural energies, how exactly does it make them personally or hypostatically unique? Or how and in what sense can we claim that the specific way of manifestation of the natural energies depends on a specific hypostasis? On what basis can we claim that the existential energies might vary in their intensity—not only across different hypostases, but also in a specific hypostasis according to its existential states and temporal periods?

The answer to these questions was paradigmatically given by Maximus the Confessor: the hypostatic specificity can be explained by the concept of *ἕξις*. It defines the hypostatic factor in the manifestation of the natural energies/actions. Maximus understood the Aristotelian concept of *ἕξις* mainly as an 'inner hypostsatic state' or 'stable predisposition' in opposition to *θέσις* which is translated as 'emplacement' or 'position' and describes the natural order of beings.*Ἕξις* is also different to *διάθεσις*, which is usually translated as 'disposition' and refers to the less stable attributes that are easy to remove and change. Aristotle distinguishes (in consideration of the human being) two types of attributes as 'stable inner states': some are present from birth, and some are assumed during life.[61] The same is analogically valid for every singular being. Maximus defines *ἕξις* as 'constitutive characteristic' (*συστατικὴ ἰδιότης*) for the activity of the *ὑπόστασις*. The *ἕξις* is described as potential and as a medium or mediator (*μεσότης*) between forces and energies.[62]*Ἕξις* is a stable internal inclination that defines *τρόπος χρήσεως*, the specific way of using the natural powers and capacities within the respective way of life (*τρόπος ζωῆς*).

[60] Cf. Василий М. Лурье, *История византийской философии* (С. Петербург: AXIŌMA, 2006), 378–379.

[61] Aristotle, *Categories*, VIII, 8b26–9a13.

[62] Maximus Confessor, 'Disputatio cum Pyrrho' (PG 91:352A).

The ἕξεις are the hypostatic factor in the direction and definiteness of the actions. They are the inner filters of the natural actualization. The teaching about ἕξις positions the problem of the being within a clearly hypostatic perspective. Maximus the Confessor considers the ἕξεις as pillars of self-determination, where ἕξις directly associates with what is realized in the time process.[63] *Mutatis mutandis*, the concept of ἕξις corresponds to *Gestimmtsein*, *Stimmung*, and *Befindlichkeit* in Heidegger: he interprets *Befindlichkeit* as a constitutive element of the *In-Sein*.[64]

The ἕξεις are best understood as subject-carrying or psycho-morph mediators. In addition, they are in complete accordance with the requirement that 'mediators are not causes and that without transformations or translations no vehicles can transport any effect'.[65] From the point of view of Byzantine scholars, the dominant understanding of *habitus* (even within the context of ANT itself)[66] appears to be unable to incorporate the complexity of the Greek notion of ἕξις. In the Latin context, however, *habitus* appears much closer to the domain of causal movements and to the attributes of the substance, since it characterizes something in the world in its reference to the other things and in its positioning at some established order.

The ἕξεις rather add the specific definiteness of being in the *tropes* (τρόποι) of their dynamics, hence they are taken (in the case of the human being) as a fundamental demonstration of freedom. Through the personification of his natural energies, a man becomes responsible for the constitution of his or her own being. Indeed, both the forces and energies are natural, but they are defined and specified hypostatically via the 'filter' of the stable inner states, the ἕξεις. It is important to emphasize that the ἕξεις do not simply 'process' the natural energies: they define the natural energies (the energies in the proper sense) and direct the causal energies (the 'movements').

It is from this perspective that one should reflect on the 'naturalness' of social innovations and the changes in paradigms, lifestyles, and ways of social existence that are quite often inexplicable in the context of the visible circumstances. This reflection should also include the perseverance or endurance, independently, and even in spite of any social, cultural, biological, or other predeterminations. Thus, finally, one can explain the unequal intensity of the natural energies radiated simultaneously by different beings, or by the same being at different moments of its own history.

Taking the perspective of ὑπόστασις and ἕξις leads necessarily to the hypothesis that the transition of an actor from one to another network makes him/her an 'other': that the actor is deprived of self-identity. The existence and agency of the ἕξεις presuppose and guarantee precisely the specific history of the hypostasis. It is from its horizon that the effects of durability, resistance, suffering, or endurance can be identified. The analysis of specific social situations, carried out within the

[63] PG 91:324D–325A.
[64] Martin Heidegger, *Sein und Zeit* (Tübingen: Niemeyer, 1979), 11.
[65] Cf. Latour, *Reassembling the Social* (cf. n. 16), 214.
[66] Cf. Ibid., 211; Kapriev, 'The Byzantine Trace' (cf. n. 3), 138.

ANT paradigm, shows that a 'translation' inevitably implies the existence of an initial 'script' (story) or configuration of actors with actual inscribed interests (and therefore stories) who then undergo the process of transformation. The unfolding of Latour's research topics (e.g., Pasteur and entrepreneurship) shows that understanding activity as a sequence of 'events' and sociality as a process of continuous transformation requires something pre-existing, something durable and permanent:[67] the activity records or stories of the human and un-human actors. They should be considered an expression of the uniquely personal existential predispositions and histories of the actors that could be described through the concepts of hypostatic particularity, existential actions mediated by their *ἕξεις* and perichoretic synergy.

7. The perichōrēsis and the synergy

The use of the notion of *ὑπόστασις* allows avoidance of traditional problems in the assumption of the 'actantial' character of the objects considering them as autonomous agencies in their different interactions. It should be emphasized that the being in a hypostasis is potentially able to incorporate or en-hypostasize the existential energies of other natures. The hypostases do not only manifest their natural energies but also incorporate external natural energies that become part of their own hypostatic existence. In this way, by means of their proper energies, different hypostases can interpenetrate each other or co-inhere in each other. It is the so-called 'perichoresis' (*περιχώρησις*, interpenetration): the inter-communication and mutual energetic penetration of two or more natures together with their properties and energies. The expression *ἀντίδοσις ἰδιωμάτων* (exchange of properties) has the same meaning. It expresses the fact that the properties of the two natures are not simply attributed to the hypostasis. There is a real exchange between the natures and their properties. In this interpenetration or co-inherence both the natures and hypostases preserve their otherness. The single hypostasis is able to accept the actions of hypostases of a different nature without becoming one with them, and based on this, to modify its habitual causal and existential actions.

It is not a secret that these concepts were first introduced in Christian philosophy in order to explain the relation between the two natures within the composite hypostasis of Christ. The term *περιχώρησις* describes the mutual inter-penetration or co-inherence of Christ's Divine and human natures together with all their properties and energies, preserving their otherness in relation to each other including their natural properties (Christ is 'perfect in His Godhead and also perfect in His manhood; truly God and truly man'). Here it is strongly emphasized that the divine nature in the hypostatic union does not absorb the human nature, but includes it in a synergy/*συνεργία*, co-action and co-activity.[68] The Byzantine tradition extends this

[67] Cf. Чалъков, *За предприемачеството и устояването* (cf. n. 5), 31 et 117.

[68] Cf. Maximus Confessor, 'Ambigua ad Thomam', 5 (PG 91:1053B); Id., 'Opuscula theologica et polemica', 16:208AB); Id., 'Disputatio cum Pyrrho' (91:337CD).

understanding to all hypostases and natures, both finite and infinite, that are en-hypostasized within the hypostases.

Gregory Palamas maintains that the God-blessed—the saints—are filled with divine natural energy and thus live the life of God Himself. The en-hypostasization of the supernatural energies (i.e., the existential energy of the divine nature) is the essence of their deification (*θέωσις*). While observing the tradition, Gregory Palamas interprets the deification of man analogously with the deification of Christ's humanity due to the *περιχώρησις* within the hypostatic union. Palamas insists that this relationship, unmediated by creation, cannot be thought as anything else but participation in God himself, not participation in his nature, but only in his extra-trinitarian manifestations, that is, his actions and energies.[69] This participation is the contemplation of the divine energy. Palamas emphasizes that the knowledge of God through his eternal energies is supernatural in the true sense of the word. In it, the nature of man is enlightened by the Divine light, which is above human nature, and in him the existence of God is at work: he is deified.[70] This immediate existential knowledge of God is therefore called 'experience' (*πεῖρα*). In deification, man rises 'beyond' the existential limits of his nature. This cannot happen on the basis of natural human capacities—repeats Palamas—because otherwise a man could become a god in his own human nature.[71] The deified man does not cease to be a man by nature, but his natural energies are in synergy with the divine natural energies and introduce divinity into his existence.

The fact that the concept of *περιχώρησις* denotes the mutual penetration and co-inherence of two (or more) different natures (together with their own properties and energies) while preserving their proper otherness opens a unique opportunity to enhance the conceptual apparatus and the explanatory power of ANT. The opportunity is associated with the possibility for the description of specific circumstances associated with the emergence of composite hypostases including or combining multiple sources of agency as well as circumstances associated with the inclusion of multiple natures (for example, human and non-human, but also the radically different non-human natures of technological and non-technological artifacts) under the guidance of seemingly single actants.[72]

This perspective allows the emancipation of objects and non-human beings with respect to man and treating them as full-fledged actors within the framework of the new understanding of activity proposed by ANT, while maintaining the aspect of asymmetry in their relations and the peculiarity of human and all other actors.

[69] Gregorius Palamas, 'Contra Akindynon', I,6, *Ιρηγορίου Παλαμά Συγγράμματα*, τομ. 3, επιμ. Παναγιώτης Χρήστου (Θεσσαλονίκη: Κυρομάνος, 1970), 42, 6–10.

[70] Gregorius Palamas, 'Theophanes', 21 et 29, *Ιρηγορίου Παλαμά Συγγράμματα*, τομ. 2, επιμ. Παναγιώτης Χρήστου (Θεσσαλονίκη: Κυρομάνος, 1966), 247, 14–17 et 256, 23–257, 8.

[71] Gregorius Palamas, 'Triades', III,1, 26, *Ιρηγορίου Παλαμά Συγγράμματα*, τομ. 1, επιμ. Παναγιώτης Χρήστου (Θεσσαλονίκη: Κυρομάνος, 1988), 638, 21–26.

[72] Tanev, 'Actor-Network vs Activity Theory' (cf. n. 4), 78.

In this context, however, it should be emphasized that the elimination of the 'natural-social' contradiction leads to the relativization of the 'natural-cultural' relationship. However, in the proposed model this relationship is not completely eliminated. Culture is understood here as the exchange of signs—explicitly and historically formed, accumulated and transmitted through a tradition and its corresponding languages; signs that are validated in a social community, generating an action and forming part of it. All this refers again to the specifics of the actor, as well as to two other important elements in our analysis: corporeality and, respectively, inter-corporeality.

8. The body

All available energies in a hypostasis—its own existential and causal natural actions, as well as the en-hypostasized activities of other natures, are in a state of *συνεργία* (synergy, co-operation), which is realized in the body and which the body manifests. Gregory Palamas is the Byzantine thinker who particularly emphasizes that the body is the absolute possessor, co-ordinator, and mediator of every human experience, both its own and the supernatural. He considers the body as the actual holder of man in being, which makes him a human being and defines his peculiar position in the world.

Palamas perceives the heart (*καρδία*) and not the mind as the center of the totality of a deified human being. Our soul, he explains, is both living and acting, it possesses many powers (*πολυδύναμον πρᾶγμα*), one of which is the *νοῦς* (the mind). The soul uses its own body as an organ and imparts life in it (*χρῆται δ' ὡς ὀργανῳ τῷ ζῆν κατ' αὐτὴν πεφυκότι σώματι*). The heart is the inner container (*μεσμεσαίτατος ὄχμα*) of all naturally and supernaturally enabled human energies. It is defined as the 'first corporeal organ of the *nous*' (*πρῶτον σαρκικὸν λογοτικὸν ὄργανον*), as the governing organ (*ἡγεμονικὸν ὄργανον*), and the throne of the graceful gifts, where the *νοῦς* and all noetic thoughts are stored. That is why a praying mind feels itself, its properties and states in the heart itself. In this sense, Palamas emphasizes the need for the practitioners of *ἡσυχία* to constantly return and enclose their minds in the body, and especially in the innermost body of the body, which is the heart. [73]

Palamas, who lays a great emphasis on the psychosomatic integrity of man, regards the body as the organ that co-ordinates man's natural (noetic, psychic, and somatic) and supernatural energies. Through this organ, they come together, step out of the body, and influence the surrounding world.[74] Thus, in the Byzantine tradition

[73] Gregorius Palamas, 'Triades', I, 2, 3; II, 2, 16, *Ιρηγορίου Παλαμά Συγγράμματα*, τομ. 1, επιμ. Παναγιώτης Χρήστου (Θεσσαλονίκη: Κυρομάνος, 1988), 395, 17–396, 22; 524, 9–12.

[74] Cf. G. Kapriev, "The body as coordinator of natural and supernatural energies in human beings in Maximus the Confessor and Gregory Palamas, in: *The Wedding Feast*, ed. Paul Ladouceur (Montreal: Alexander Press, 2010), 103–112.

there is an emphasis on the fact that the human body (and through it the human psychosomatic integrity) can incorporate and assimilate actions/energies originating in other beings. Once assimilated, these energies enter into a synergy (synergizes) with the energies in the human body and it is the body again that manifests the synergy outwards.

Based on the above insights, we can claim that the emergence of stable and long-standing heterogeneous micro-communities based on the human inter-action with the particular properties of specific non-human agents can be described as a unique relationship of inter-corporeality.[75] At the same time, it is important to note the asymmetry of these interactions, with all forms of mutual activity and passivity resulting from the contextuality of the specific circumstances and the differences in the natures and the hypostases involved in them.

9. Hypostasis and person

Michel Callon and Bruno Latour presume certain basic differences between the agents involved in the heterogeneous interactions: 'demanding that the non-humans should have intentions in the same way as humans is in itself an anthropocentric or sociocentric demand'.[76] The Byzantine tradition addresses these differences by distinguishing between *ὑπόστασις* and *πρόσωπον*/person. This synonymy arises from the fact that they are used by Byzantine authors mostly in the field of the doctrines of the Trinity, Christology, and anthropology. The differences appear in comparison with the other beings. Every self-existing being has its hypostasis, including inanimate objects such as stones, machines, trees, and houses, while *πρόσωπον* denotes only rational beings (God, angels, human beings), who form their mode of action through a rational will. John Damascene borrowed the distinction drawn by John Philoponus. From this point of view, a person is determined by the relation of a rational hypostasis to other hypostases. According to the Damascene, we can say that an administrative officer represents the person of the emperor (*τὸν ὕπαρχον δὲ πρόσοπων ἔχει τοῦ βασιλέως λέγομεν*)[77]—he is delegated by the emperor. Hypostasis, however, cannot be delegated.

This distinction generates a paradox. If we accept that it is the hypostasis that manifests the energies belonging to the en-hypostasized nature (or natures), we should conclude that every single hypostasis is in a state of active energetic exchange with all other hypostases becoming by necessity part of a 'dialogical network'. On the other hand, obviously, every rational being can choose to communicate or not

[75] Tanev, 'Actor-Network vs Activity Theory' (cf. n. 4), 79.

[76] Michel Callon, Bruno Latour, 'Don't Throw the Baby Out with the Bath School! A Reply to Collins and Yearley', *Science as Practice and Culture*. ed. Andrew Pickering (Chicago: University of Chicago Press, 1992), 352–353.

[77] Johannes Damascenus, 'De haeresibus', 83 (PG 94:749C).

with others, consciously choosing a state of self-isolation. We should therefore be very cautious when speaking about the relational character of the human person. Rational beings can consciously 'put themselves in the place of other beings' and 're-present' them. What that means in the language of the teaching on the energies is that a person has the capacity and the ability to un-spontaneously direct, modulate, concentrate, or disperse his or her own energies. This is the special way for humans 'to take the relay' because of their nature and the constitution of their persons. This activity allows man to accept the actions of some 'other nature' through the relationships of inter-corporeality and make them the basis of a new type of (causal) actions of the human agent. Such perspective enables the unfolding of a new understanding of creative human activity (creativity).

Against this background, a currently debated topic can be dealt with. I mean the so-called transhumanism and the corresponding theories and considerations. According to the most popular opinions, transhumanism should be associated with the transformation of the human condition by developing and making widely available sophisticated technologies to greatly enhance the human intellect and human physiology. There are ongoing discussions of the potential benefits and dangers of emerging technologies that could overcome fundamental human limitations as well as the ethical implications and limitations of using such technologies. The most common transhumanist thesis is that human beings may eventually be able to transform themselves into different beings with abilities so greatly expanded from the current condition as to merit the label of post-human beings.[78] These enhancements, transhumanists insist, would arguably have a more radical impact on human beings than any other development in the history of humankind. Some of the emerging transhumanist questions are: Will 'post-human' technologies be available to all persons, or will a superior 'post-human race' arise to dominate the human species?[79] The ongoing analyses raise concerns about the eventual historical end of humanity and foreshadow the impending loss of human identity that will be forced by the development of new technologies and their incorporation into the human condition. They talk about the generic limitations of human capacities, their natural borders, and the upcoming opportunity to go beyond them.

It should be noted here that such concerns can be found in any new era of technological development. Man has been long implanting technological tools in himself. Since the fourteenth century, the use of glasses has become more and more widespread, various types of dentures have been widely used, and so on. Indeed, developments in electronics and artificial intelligence seem to create completely new levels of challenges:

[78] https://en.wikipedia.org/wiki/Transhumanism#cite_note-Bostrom_2005-2.

[79] Cf. e.g., *Religion and Transhumanism: The Unknown Future of Human Enhancement*, eds. Calvin Mercer, Tracy J. Trothen (Santa Barbara, California – Denver, Colorado – Oxford, England: Praeger, 2015).

> The technologies around us are becoming more complex, more intelligent and more autonomous as compared to what has been known before. This trend goes in parallel to an increasing scale of society which amplifies different societal pressures from a number of different perspectives… In the meantime, the only face, *persona* or *prosopon* before me is my computer screen. Behind this 'persona' emerges the hypostasis of the computer with all of its functions, interactive features, messages, pop-ups, failures or 'user friendliness'… In this sense non-human actors around us acquire a definite character and expression; they are endowed with a life on their own and with a presence.[80]

In summary: the question is about the boundaries of the human condition. But, how far are the limits of human nature? How far does the potential of humanity reach? Answering these questions alone could provide some sense to any meaningful critique of 'transhumanism' as a potential destruction or abolition of the human. The anthropological perspective developed here places a bold question mark on such hypotheses. Human nature, if it eventually reaches its limits, will rather 'refuse' crossing and going beyond them: it will 'resist'. It is true that modern technological developments are really problematizing the current condition of humanity. But once again: how far are the limits of human nature or of the human condition in general? Where is the critical limit of the process of damaging or abolishing them? Thinking about the possible extreme effects of interactivity with respect to nature and hypostasis, we stated in 2005:

> It should only be added that by definition and as a consequence of asymmetry, this process *cannot be limited*: it has no end *qua* end. A hypostasis cannot accept external energies entirely and completely. In this case too, the Byzantine philosophers manifest their radical views. Gregory Palamas states categorically[81] that the movement towards the contemplation of God, i.e. towards the acceptance of the divine energies is continuous and does not end even in the outer world, in the face of God himself.[82]

I can do nothing else but repeat once again: this process cannot be limited: it has no end qua end.

[80] Tanev, 'Actor-Network vs Activity Theory' (cf. n. 4), 80–81.

[81] Gregorius Palamas, 'Triades', 2, 2, 11, *Ιρηγορίου Παλαμά Συγγράμματα*, τομ. 1, επιμ. Παναγιώτης Χρήστου (Θεσσαλονίκη: Κυρομάνος, 1988), 517, 13–18.

[82] Tchalakov, Kapriev, 'The Limits of Causal Action' (cf. n. 1), 420.

10. Concluding remarks

We once said that Byzantine philosophers would have been surprised to know that their insights and observations come in handy in sociology and in the other modern sciences.[83] Today I am not absolutely sure about that. Michael Psellus, for example, programmatically claims that, by going deeper into theory, he is able to grasp the principles / *λόγοι* of everything physical, mental, noetic, and supernatural. In this way he becomes an instrument of God (*ὄργανον τοῦ Θεοῦ*), thereby bringing closer to God and His creative providence (*ποιουμένη πρόνοια*) the boundary of humanity and, respectively, the definition of the anthropological.[84] I can point to a similar epistemic pathos in the works of other Byzantine thinkers, especially the ones who have written more systematically: *Fons scientiae* by John of Damascus and *Capita 150* by Gregory Palamas. The point is that the Byzantine philosophers' surprise would not be that substantial.

It is not our intention, however, to promote a kind of 'sociological palamism', for example. Byzantine philosophy failed in its systematic form by the middle of the eighteenth century at the latest. Our idea is instead to draw a parallel between problem situations in contemporary science and technology studies and in Byzantine theology and philosophy. By outlining the remarkable achievements of the latter and reconstructing the frameworks that made them possible, we would like to elicit some important methodological lessons relevant to the study of scientific and engineering practice.

> Looking at the achievements of Byzantine thinkers allows us to more accurately highlight the concepts of activity which are so deep-rooted and somewhat naturally-occurring in the Latin tradition, in critical opposition to which actor-network theory (and the so-called 'pragmatic position' in contemporary sociology) developed its alternative understanding of activity as 'translation' and 'event'.[85]

Considering what has been discussed so far, it should be noted that more efforts are needed in order to develop the potential of the proposed line of reasoning. Getting out of inherited thought patterns is a difficult and slow process and, quite often, only partially accomplished. In any case, at a seminar in Cologne in June 2015, Bruno Latour told me that for him ''hypostasis' is synonymous with 'substance'. If such prejudices are not overcome, however, the actor will continue to be thought of as an individual, and not as a hypostasis, not as a unique actor. The internal structure and the existential specificity

[83] Ibid.

[84] Michael Psellus, *De omnifaria doctrina*, 73, Critical text and introduction Leendert Westerink (Nijmegen: Centrale Drukkerij, 1948), 46,10–14.

[85] Чалъков, *За предприемачеството и устояването в науката* (cf. n. 5), 191.

of actor beings operating in the networks will remain 'black boxes' and the degree of ANT's theoretical abstractness will remain too high.[86] 'ANT needs some further conceptual developments in order to be able to cover some important and unique aspects of human behavior',[87] as well as the behavior of non-human actors. 'And it is no coincidence that this requires a rethinking of the inherited notions of human activity—a rethinking that was initiated by ANT more than thirty years ago but, as we believe, was not fully accomplished'.[88] We remain fully convinced that the 'Byzantine trace' could open up new problems and challenges, new opportunities and perspectives.

[86] Kapriev, 'The Byzantine Trace' (cf. n. 3), 142.
[87] Tanev, 'Actor-Network vs Activity Theory' (cf. n. 4), 78.
[88] Чалъков, *За предприемачеството и устояването в науката* (cf. n. 5), 133.

The Cosmos in the Bible and science

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In this article I present the Biblical description of the Creation of the Cosmos in parallel with the description of contemporary science. The first part deals with the events that started the whole Universe. These are the events that took place during the first day of the Bible and the night that followed it. The first day begins with darkness, which is subsequently dissolved by a bright light that initially shines like in a hot summer noon. In the sequel, this light evolves and eventually disappears through an impressive evening, after about twenty million years. Then comes the first night that ends after about nine billion years, with the emergence of the primitive Earth. The second part of Creation describes how an earth observer would have viewed the formation of the Earth and its waters and the appearance of the living beings and man. The second to the sixth days appear to be merely long periods of time. They do not have a day-night structure like the first day.

The scientific understanding of Creation perceptions I am presenting here is based on the assumption that the forces we see today in Nature were created at the very beginning and have remained unchanged ever since. If we do not make this assumption, we cannot say anything. The few measurements we can make agree with this assumption.

For measuring time, we use the clock of General Relativity and what is known from astrophysical measurements. Before Creation began, time as we know it did not yet exist. Space did not yet exist either, and the Universe was just 'nothing'.[1] From this nothing therefore began the creation of space (the heavens of the Bible) and the emergence of the primitive matter in it.

Before moving on, however, I will mention that until the early twentieth century, the common scientific belief was that the Universe had no beginning. Space was believed to be eternal, as well as matter. It was not until after 1920 that it was discovered that the Universe indeed had a beginning.

Let us start with the Biblical description of the first day.[2]

> In the beginning God created the heavens and the earth. And the earth was formless and invisible and darkness covered the face of the deep. And the

[1] This is equivalent to the *μη ὄν* in Greek.

[2] New Revised Standard Version Bible, copyright 1989, Division of Christian Education of the National Council of the Churches of Christ in the United States of America. The number after the name of any Bible book gives the chapter.

> Spirit of God swept over the waters. And God said, 'Let there be light'; and there was light. And God saw that the light was good; and God separated the light from the darkness. And God called the light Day, and the darkness he called Night. And there was evening and there was morning, the first day (Gen. 1:1–5).

'In the beginning God created the heavens and the earth…' Let us look at time, space, and matter separately. Time, as science perceives it, was created and began to run *in the beginning*. In the creation of the Angels that had happened before, there was of course some kind of time, but not the time we are talking about here. Our Lord Jesus Christ is 'begotten of the Father before all ages'. The Son was begotten, not created, before any kind of time had started running. Only the Holy Trinity, the Father, the Son, and the Holy Spirit have no beginning.[3]

The redistribution of nothing: The heavens of the Bible is the space, and the formless earth is primitive matter. Both emerged at the beginning. Before this beginning, there was neither space nor energy or matter; the universe was simply nothing. At the beginning, the Triune God took the zero energy, this 'nothing' and he separated it into two parts: a positive part, which would become space and matter, and a negative part, which would become gravitational dynamic energy, which would attract the various pieces of matter to each other. Both these parts are of huge magnitude today, but of opposite signs, so that their summation still remains zero.

The entirety of space was originally an extremely small sphere containing all matter of the universe. In fact, it was not yet space. And suddenly, at the beginning (i.e., at time zero), this small sphere started exploding (this is the Big Bang) and its various parts started moving violently away from each other, creating space. At first, this motion was very violent. Then it slowed down… Even today, that original very small sphere, which is now immense, continues to swell and the universe continues to expand. And we can observe and measure this expansion.

This 'redistribution of nothing' is a basic consequence of general relativity, and it is consistent with the Christian belief that the Triune God created the universe from 'nothing', without using any previous 'entity', not even space. The universe is indelibly sealed with the nothing from which it started.

For living beings, however, general relativity cannot help. But the idea that living beings also are indelibly sealed by the nothing from which (by the command of the Triune God) they were created, is plausible. Humankind alone escapes this because of its immortal soul, which prohibits the ultimate return to nothing—even for the body!

[3] Arius could not understand that time had a beginning and that the Holy Trinity existed before any kind of time had started running.

Shortly before the primordial light shines: '…the earth was formless and invisible and darkness covered the face of the deep. And the Spirit of God swept over the waters' (Gen. 1:2).

As space was expanding, the matter inside the Universe was changing rapidly and its matter density was decreasing. Its temperature, which was initially very high, was falling rapidly at the beginning, slowing down later. Numerous particles (like those found in modern accelerators) were being produced then and almost immediately were decaying.

Shortly after the first few minutes though, the situation was temporarily stabilized, and the known matter of the universe consisted only of the light nuclei of hydrogen, helium, and traces of some other light elements, as well as electrons and neutrinos. There were no atoms or molecules at that time, and this may explain why Moses called this mater 'formless'.

The aforementioned particles of known matter were moving freely at that time, blocking the propagation of the electromagnetic waves describing light, which existed from the very beginning, forcing the universe to be opaque and thus dark. This situation lasted until the time when the universe was approaching the age of 380,000 years. It is remarkable how Moses, writing at around 1300 BC, manages to describe this by 'darkness covered the face of the deep'(Gen. 1:1).

In addition to the known matter, the universe also contained dark matter, which today is about five times more than known matter. Little is known about it. The dark matter does not affect the propagation of light and the aforementioned darkness.

'…and God said, "Let there be light"; and there was light'. When the universe reached the age of 380,000 years, its temperature dropped to about 3000° K,[4] allowing the nuclei that had already been manufactured to bind electrons, forming neutral atoms. Then, more or less suddenly, the universe became transparent to electromagnetic radiation, known in scientific terminology as 'black body' radiation.[5] At the temperature of 3000 K, this radiation was a dazzling white light coming from everywhere. That was the light created by the Lord's command 'Let there be light'.

Of course, there were no people at that time. However, the Bible is anthropocentric (i.e., it describes the events that a person would have seen if people had existed then). Using a simple language, we could say that the aforementioned light was like the light during summer at midday, where everything around is hot and radiates.

It is also worth mentioning that the first day had no morning; it started from noon. It is intriguing to point out that the first morning mentioned in the Bible's description is the one of the second day. Worth mentioning is also the description of

[4] K describes the unit of temperature called Kelvin. Zero Kelvin corresponds to -273° Celsius.

[5] The black body radiation was discovered at the beginning of the twentieth century. Its physical properties solely depend on its temperature.

St Nicodemus of Mount Athos: 'the light in it did not appear as in a morning, but as in midday, according to Theologians'.[6]

But as time was passing and space was expanding, the wavelengths of that light were also growing, while its brightness was diminishing. Today—13.8 billion years later—it continues coming to us with almost the same intensity from everywhere, but it is no longer visible by human eyes. Its brightness is about 100 billion times smaller than its original value and its wavelengths are some 1100 times higher, while its temperature has dropped to just under 3 K. We can no longer see it with our own eyes, but we can measure it.

This is the same light, as it was when it started on the first day; it contains the same photons as it did then. In 1964, A. Penzias and R. Wilson experimentally identified it and called it Cosmic Microwave Background (CMB). These are remnants of the light born by the Divine command 'Let there be light!' Their discovery was instrumental for the acceptance of the Big Bang theory by the scientific community.

Let us go back to the time when this light first shone. As time was passing, the brightness of the light was decreasing, and its color was becoming more and more reddish until it passed in the infrared, and the first night began. The universe was about 20 million years old at that time. The first day ended in a flood of a deep reddish light. A spectacular evening indeed! 'And God saw that the light was good…. And there was evening and there was morning, the first day' (Gen. 1:4–5). Note that a day-night structure is also seen within the Big Bang theory; the Bible and scientific descriptions fit!

During the first night, stars and galaxies and clusters of galaxies were created, or at least started. And finally, at about nine billion years after the beginning, the primitive Earth appeared, signifying and the end of the first night.

We next turn to the second to sixth days of Genesis. The description now focuses on the events that took place on the Earth and cover the period of the last 4.5 billion years. At first glance one could think that these events are insignificant since the size of the Earth is almost nothing. But these events concern the appearance of the human being for whom the whole universe was created. As already said, the corresponding days do not have a day-night structure like the first day. All we can say about them is that they corresponded to long periods of time.

On the second day and the first part of the third day, the separation of waters on the surface of the Earth takes place:

> And God said, 'Let there be a dome in the midst of the waters, and let it separate the waters'. So God made the dome and separated the waters that were under the dome from the waters that were above the dome. And it was

[6] St Nicodemus of Mount Athos, *ΓΥΜΝΑΣΜΑΤΑ ΠΝΕΥΜΑΤΙΚΑ εἰς τήν Ἀνάστασιν τοῦ Κυρίου*, study ΛΒ′, α′, σ. 273, Έκδοση 7η (Βασ. Ρηγόπουλου: Θεσσαλονίκη, 1991): 'τό γάρ ἐν αὐτῇ γεγονός φῶς οὐχί ἀπό τό πρωΐ, ἀλλά ἀπό μεσημβρίας ἤρξατο, κατά τούς Θεολόγους'.

> so. God called the dome Sky. And there was evening and there was morning, the second day. And God said, 'Let the waters under the Sky be gathered together into one place, and let the dry land appear. And it was so. God called the dry land Earth, and the waters that were gathered together he called Seas. And God saw that it was good (Gen 1:6–10).

These verses offer no argument supporting the existence of water on the Earth in some stage of its construction. But in Chapter 2 it is stated that the first water that watered the Earth before man was created (and from which the seas were apparently made) did not originate from rain, but came from the depths of the Earth:

> In the day that the Lord God made the earth and the heavens, when no plant of the field was yet in the earth and no herb of the field had yet sprung up—for the Lord God had not caused it to rain upon the earth, and there was no one to till the ground; but a stream would rise from the earth, and water the whole face of the ground (Gen. 2:4–6).

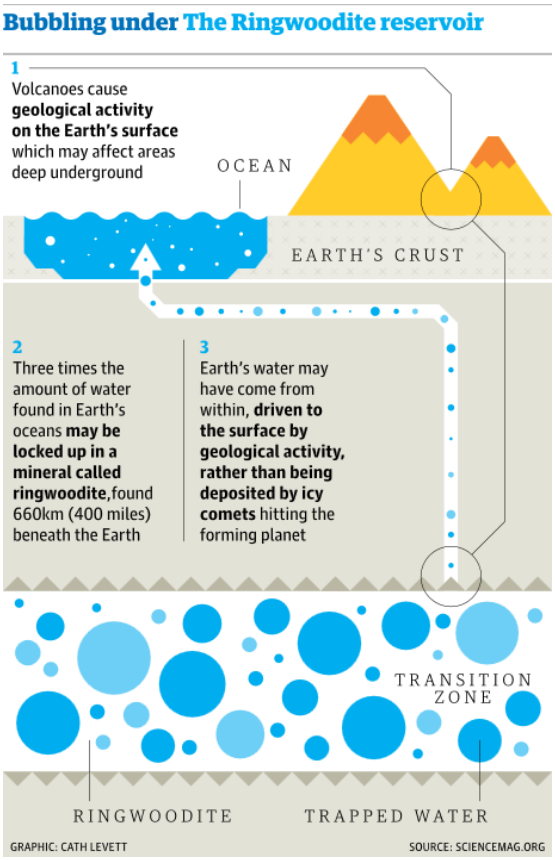
Apparently seismic rearrangements were taking place during this period, and mountains and volcanoes were appearing. The primitive atmosphere of the Earth also must have appeared during this period.

The abundance of water on Earth is striking, especially if one compares it to what is happening on the neighboring planets Mars and Venus. In the Psalms, the waters are even described as the foundations of the Earth: 'to him that stretched out the earth above the waters' (Psalm 135 (136), 6), 'he hath founded it upon the seas, and established it upon the floods (Psalm 23 (24) 2), 'who layeth the beams of his chambers in the waters: who maketh the clouds his chariot: who walketh upon the wings of the wind' (Psalm 103 (104) 3), 'then the channels of waters were seen, and the foundations of the world were discovered' (Psalm 17 (18) 15).

Let us now see what science says about Earth's water. A very small portion of it may have come from icy comets that hit the Earth during its formation about 3.9 billion years ago. Such comets may have originated at the edges of our solar system.

But the bulk of Earth's water appears to have been produced in the Transition Zone inside the Earth at a depth of about 660 km.[7] This is illustrated in the figure below, which depicts a cross-section of the Earth. The top part of this figure illustrates an ocean and some volcanoes at the surface of the Earth, while the bottom shows the Transition Zone at a depth of about 660 km, where a huge amount of water is trapped—probably more than two times more water than in all the oceans put together. This water did not come from rain because rainwater does not go deeper than 100–150 km.

[7] See http://www.theguardian.com/science/2014/jun/13/earth-may-have-underground-ocean-three-times-that-on-surface



But why such water only appears in the Transition Zone? There is a mineral called ringwoodite,[8] which contains a small amount of water in its crystals (at most 2.6% of its mass). Almost everywhere on Earth, ringwoodite is very unstable and extremely rare. The only exception is in the Transition Zone, where temperature and pressure conditions make it stable, thus allowing for a huge amount of ringwoodite there. Part of this ringwoodite tries to move outside the Transition Zone, but this again makes it unstable, forcing it to leave its water there.

Therefore, in the Transition Zone we have free water, as well as water trapped in the ringwoodite crystals. As already mentioned, the total amount of this water is estimated to be more than twice the amount of water in all of all the oceans put together. The Transition Zone and the oceans communicate to each other using the same geological processes that cause the motion of the tectonic plates, and this communication plays a crucial role in keeping the amount of water in the oceans stable.

The final conclusion is that the water of the Earth is created mainly within the Transition Zone. This fits fantastically to the biblical phrase that 'a stream would rise from the earth, and water the whole face of the ground' (Gen 2:6).

During the second part of the third day the plants appear—first the simplest ones, then the more complex. Subsequently, the clouds that flooded the Earth's atmosphere vanished and the stars appeared. Then, on the fifth and sixth days, the fish, the birds, and the animals are created—again first the simplest ones, then the more complex. And always by God's command, who checks at every step that the result is indeed 'very good'.

Finally, during the second part of the sixth day, the greatest event of material Creation takes place on Earth. The Triune God, in a kind of a consultation of the three Persons of the Holy Trinity, says: 'Let us make humankind in our image, according to our likeness; and let them have dominion… '(Gen 1:26). 'And the Lord

[8] A kind of brown diamond.

God formed the first man Adam from the dust of the ground, and breathed into his nostrils the breath of life; and the man became a living being' (Gen. 2:7). 'And God saw everything that he had made, and indeed, it was very good. And there was evening and there was morning, the sixth day' (Gen 1:31).

As can be seen throughout the text, Adam was made beautiful (very good, Gen. 1:31) and wise (Gen. 2:18–20). And Eve of course! And they must have retained this beauty and wisdom, even when they had already been driven out of Paradise on earth. This is also evident from the information that soon after their exile the development of civilization on earth began (Gen. 4).

Let us now turn to the paleontological findings. It should be noted from the outset that the definition of the human being in paleontology is not identical to that in the Bible, as paleontology completely ignores what it means for a creature to have the 'breath of life' (Gen. 2:7), which is the main characteristic of the human being. But how can the 'breath of life' be measured scientifically?

Adam's hagiographic description given above prohibits his identification with the ugly (and now already extinct) beings of paleontology, such as the so-called Neanderthal man and others. Necessarily, then, Adam must belong to the kind that paleontologists call the *homo sapiens sapiens*.

The breath of life certainly cannot be analyzed as a scientific notion. Thus, all the beings that paleontology describes as 'men' do not have to be humans. Moreover, Adam must not necessarily be older than the oldest so-called 'man fossils' found. I personally expect that finally, when all questions are answered, science will be consistent with Adam's age in the range of 10,000–15,000 years.

Thus, material creation, at some moment of time accepted its king: the Man, who though perishable, could have lived forever, provided he had kept the first commandment. But man did not keep this commandment. And the Lord knew he would not keep it… and after a few thousand years, the Lord Himself came on our little Earth through the Incarnation.

The Lord Jesus Christ, the Son of God Himself! He came to redeem us from the tragic situation we had fallen into.

And we, who caused all this tragedy with our first and subsequent sins, have not just returned to our initial state. 'But ye we have received the Spirit of adoption, whereby we cry, Abba, Father. The Spirit itself beareth witness… that we are the children of God' (Rom 8:15–16).

Note

As already said, in our description the earthy days 2nd to 6th are simply long periods of time, for which no morning or evening exists. This can be cured if we assume that during these days, the spinning velocity of the Earth around itself, were much slower than its angular velocity around the Sun. That would make these days much longer than the Earth year, which would correspond to the time needed for

a full circulation of the Earth around the Sun. This way, all Genesis days 2nd to 6th acquire mornings and evenings. And the agreement with the Bible becomes perfect. Of course, in this case, a scientific description of creation of life on Earth becomes much more difficult. But in any case, I believe that it could have never happened without God's command.

Quantum Physics and Christian Faith

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"Traditional" or "Orthodox" Christianity is founded on the conviction that God exists in the paradoxical state of "infinitely distant" yet "closer to us than our own heart." That state is characterized by "superimposed" and "entangled" conditions that involve antinomies: God as both One and Three; Christ as both God and man; the Church as a fallen earthly institution and as a source of divine grace and life, etc. This article demonstrates the analogous relationships that exist between such elements of Christian faith and the domain of quantum mechanics. The presence and activity of God are seen in a new perspective, shaped by recent scientific discoveries concerning the microcosm. The world of the "very small" holds the key to a perception of God that reveals both His continuing creative work and His ineffable mystery.

Introduction

This text is adapted from a chapter of the book *Beyond These Horizons. Quantum Physics and Christian Faith*, published jointly by St. Sebastian Serbian Press, Alhambra, CA, and Kaloros Press, Wadmalaw Island, SC., 2019. The book itself is structured as a novel, with lectures given by a young professor of physics to a group of alumni of his university.

God beyond Reality

A prayer in the Orthodox Christian tradition describes the Holy Spirit as 'everywhere present, filling all things'. It is that Spirit, who creates and sustains the underlying Reality—the transcendent Force or Field—that gives birth to both the virtual and the actualized aspects of the world we live in. Genesis declares that at the creation the Spirit 'moved across the face of the waters', bringing order, harmony, and beauty out of primeval chaos. That is, the Spirit 'realizes' or 'actualizes' the cosmos (from which we get our word 'cosmetic', implying order and beauty). In a Biblical perspective—the perspective held by traditional Christianity, based on individual and communal experience—the Spirit of God is the *Spiritus creator*, who relates to his creation in personal terms, terms of communion and love. This does not contradict the Biblical affirmations regarding the creative activity of Christ, the Son (Jn 1:3; Col 1:16; Heb 1:2–3), but rather complements them. Together with the Second Person of the triune Godhead, the Spirit creates, shapes, and directs all of reality toward its final end, which is eternal participation in divine Life (Rom 8:5–11). This is a *trinitarian* perspective.

The Trinitarian perspective that lies at the heart of Christian faith and experience is firmly rooted in Hebrew as well as in Christian Scriptures. The Old or First Testament presents images of the person and work of 'God', of the 'Word' (as divine speech, Gen 1:1–3; in prophetic oracles, etc.), and of the 'Spirit'. For its part, the New Testament unites 'God' or 'Father', the 'Son' (Jesus, the Word or *Logos* of God, Jn 1:1ff), and the 'Spirit' in a large number of tripartite formulas and other passages. The most obvious of these are references to Father, Son, and *Paraclete* ('Advocate', 'Counselor') or Spirit of Truth, in Jesus' Farewell Discourses given in John 14–16. Other examples include liturgical formulas such as Second Corinthians 13:13 (or 14 in our translations): 'The grace of the Lord Jesus Christ, the love of God ['the Father', the Liturgy will add], and the communion of the Holy Spirit'—together with Ephesians 2:18 and 3:14–19, Romans 1.3–4, First Peter 1:2, and so on.

Accordingly, in Biblical terms God is properly conceived as 'Father', the ultimate Principle, Source, and Finality of all things; as 'Son', the divine-human Person, eternally 'generated' by the Father; and as 'Spirit', who eternally 'proceeds' from the Father, to sanctify the world and human life (an aspect developed especially in Romans 8). 'Generation' and 'procession' are terms used by the Evangelist John. They were taken up during the first four centuries AD by the greatest theologians of the Church and woven into the doctrine of the Holy Trinity. The eternal Son of God and the divine Spirit of God, in the thought of St Irenaeus of Lyon, are the 'two hands of the Father', who together create and sustain all things, while relating *personally* to those who seek God and long for God. Together the three Persons of the Godhead constitute *one God*—'one in essence and undivided', as the Liturgy of the Church declares—who liberates humanity from death and corruption through the central event of human life and history: the incarnation, death and resurrection of the eternal Son of God, the God-man Jesus Christ. This Trinitarian perspective is essential if we are to grasp the full reality of God and of his relationship to the created order.

We have to conclude, then, that God lies 'beyond the beyond'. He brings all things from non-existence into being, and he provides it all with purpose and direction, while being in no way confused with it. His continual act of creation, however, is not limited to the material world of our experience. If there are indeed other worlds, other dimensions of created reality, these too have their origin and end in him. As do any other conscious life forms elsewhere in the cosmos, if in fact they exist. There is in this perspective a certain hierarchy of being. We begin and end 'beyond being' with God himself, three 'Hypostases' or 'Persons' united in one divine substance or essence. This God is 'beyond reality' and beyond existence itself, as the ultimate Source of everything: of all being and of all meaning and value. He creates and sustains the universal generating field of Reality, which corresponds to Bohm's implicate order. From that field there comes forth virtual reality in its multiple expressions, some of which become actualized as quanta. These, then, constitute

matter and perhaps 'spirit' in the form of consciousness. Consciousness, however, more likely derives from a creative process that is independent of matter and of the quanta that compose it. As I will point out later on, consciousness seems to be a transcendent phenomenon, common to human beings and certain higher animals, but perhaps also to other forms of life. Some would claim that human consciousness derives directly from the Consciousness of God, making up what Scripture calls the *imago Dei*, the image of God, that characterizes every human person.

The World in Superposition

All of this means that we need to look at the world in an entirely new way. We need to grasp the fact that created Reality is vastly more extensive, more complicated, and more mysterious than we can possibly imagine. Our five senses help us to comprehend the classical world around us and, to some extent, within us. But Reality itself is far more than our senses can fathom. (Just imagine that what is called the 'solar neutrino flux' passing through our bodies is in the neighborhood of one hundred trillion neutrinos each second, and we are oblivious to each and every one!) Various well-grounded theories hold that there exist, if not other worlds, at least other dimensions beyond the four that we directly experience: three of space and one of time. It may well be that we are surrounded by and perhaps filled with multitudes of dimensions of the 'real' that we will never know, never perceive, and never be able to analyze or manipulate.

Yet conscious, intelligent beings in those dimensions may very well have the capacity to know and to interact with us. This, in any case, is the conviction of people who have experienced the presence and intercession of what Christians call 'the communion of saints'. These are souls who are physically dead. Yet they continue to exist on another plane of reality. They have the capacity to pray for us and to influence events in our space-time universe. What has been identified as 'angels' and other spiritual beings may also dwell in a domain or dimension of reality from which they can interact with us. There are countless witnesses to such occurrences, and countless experiences of the 'beyond' that influence our life, for good or ill. If there are saints and others who can pray for us, then it seems likely, based on the experience of most of the world's population, that there are also what are called 'demons', nefarious powers that can likewise have an impact on human life. If quantum theory has anything to say about realities like these, it is to affirm that beyond our very limited horizons, in the macro- and microscopic dimensions of our knowledge and experience, there exists a supra-cosmic Field from which all things proceed and toward which all things move.

From a theistic perspective, we have to stress once again that this movement, this process inherent in creation itself, leads toward an End with purpose and meaning. The experience of billions of Christians, Jews, Muslims, and others has confirmed

beyond doubt that human life derives both its purpose and its significance from the transcendent 'Reality beyond Reality' that we call God. We conceive of that ultimate Reality in different ways. But all major faiths agree that this Reality is 'intentional', purposeful. It not only creates the world; it also saves it. This means that God preserves his human creatures—bearers of his divine Image—beyond physical death and enables them to participate eternally in a sublime mode of existence that the New Testament calls 'eternal life', life in 'the Kingdom of God'.

In classic Christian terms, that divine Force or Power which issues from the Godhead can be thought of as 'divine energies' that are manifested in time and space by the Persons of the Son and the Holy Spirit. Together the Son and the Spirit work out what theologians call the 'divine economy'. Their united action accomplishes this saving, transforming work by investing human persons from the moment of their conception with ultimate value and purpose. (This is what leads theologians to affirm that 'every human being is worthy of infinite compassion'!) That saving work liberates humankind from the bondage of sin, death and corruption by destroying the power of death through the *descensus ad inferos* or 'harrowing of Hell'. This refers to the descent of the crucified Christ into Sheol or Hades, the realm of the dead, to liberate those held in captivity to the power of death by what can be considered a 'new Exodus'. First Peter alludes to this in chapters three and four. The same theme appears in Matthew 16:18, Ephesians 4:7–10, Revelation 1:18, and it is depicted with special force in the Orthodox icon of Pascha or Easter. The descent into Hell, the domain—or rather the condition—of endless alienation and separation from God, is then reversed and its purpose is fulfilled by the resurrection and ascension of the Son of God. Identified by the angel in the tomb as the eternally Crucified One, the Son 'ascends into heaven' in the fullness of his God-manhood, bearing within himself both divinity and transfigured humanity.

Through baptism into his Body, the Church; through faith that inspires personal commitment; and through works of love or acts of charity, human persons are literally 'incorporated' into Christ's divine, glorified life. This economy or saving work is complete when those who are thus 'saved' attain eternal participation in the very life of God, a participation that the Church Fathers audaciously termed *theōsis* or 'deification'. Yet even in this life, Christian faith maintains, those who long for this salvation can enjoy it already and personally in the form of what the apostle Paul calls 'the first fruits of the Spirit'. These offer a foretaste of eternal life, bestowed in the here and now by the Spirit of God. Those 'fruits' are, very simply, the grace and power we know as love. Not *eros* or erotic love, nor *philia* or friendship; but *agapē*. This is the freely offered love of God, a love of disinterested self-sacrifice, which became manifest and accessible to us through the death on the Cross of Jesus Christ. It is precisely this love, an expression of God's very Being, that provides meaning to us in an otherwise meaningless universe.

Analogies

We can now explore a few parallels between quantum phenomena and certain tenets of Christian faith. These are to be understood as mere analogies. We should avoid the impression that ecclesial dogmas are derived from or are dependent upon discoveries in the area of quantum mechanics or, for that matter, findings in any other area of science. Elements of faith are derived rather from direct experiences of the Divine, the Holy. No scientific methodology has access to these realities. Yet the analogies we draw can, I believe, be helpful in providing us with a picture of the universe and of ourselves that corresponds both to the world of Scripture and to the world of physicists, biologists, and others in the community of professional scientists.

Most of the analogies recall theories of superposition and entanglement. As we have seen, 'spooky actions at a distance' are dependent on non-locality. Early attempts to understand this phenomenon, together with particle-wave duality, included the 'double slit' experiment, devised by Thomas Young back in 1801 and perfected during the twentieth century. The experiment involves sending a beam of light or even a single photon through an apparatus with two narrow parallel slits, behind which there is a detection screen. A beam of photons so projected will create an interference pattern on the screen, showing that they have (improbably but really) passed through both slits at once and have interfered with themselves. The photon is a particle; but at a more fundamental level it is a wave, a 'probability wave' that collapses, according to the Copenhagen theory, upon observation or measurement, transitioning from a virtual to an actual state. At the microscopic level, then, quanta exist in a particle-wave superposition. Repeated experiments have provided what seems to be irrefutable evidence that all of quantum reality exists in this superposition of states. The Copenhagen theory assumes that the transition from a virtual to an actual state occurs through collapse of the wave function in a process of decoherence.

David Bohm, however, with a significant number of physicists today, rejects the notion of wave function collapse. His theory of 'quantum potential' describes a process that directs the non-local movement of quanta or quantum particles on every level of reality. He pictures the quantum potential as a field that fills the universe and, as a source of *information* rather than energy, influences virtually everything that exists. In fact, it can be said that the quantum potential 'contains' all that exists and serves as its source of being. What we perceive empirically are individual, separated realities; but these are in fact illusions. All that we call 'actualized realities' are a kind of emanation, an ephemeral manifestation of the deeper Field that underlies literally everything. In this perspective, all that exists is interconnected, and the world is essentially a hologram, governed by what Bohm terms a 'holomovement'. In this view all things are in flux, directed by the underlying quantum Field, which can be identified with the transcendent Reality Force we spoke of earlier.

For Bohm, all of reality is characterized by holographic entanglement, resulting in what he terms an Undivided Wholeness. As we have seen, that Wholeness derives ultimately from the implicate order, and thus it can be likened to the ultimate Reality behind all being, fashioned and put into operation, from a Christian point of view, by the ceaseless creative activity of the Holy Spirit. Bohm, of course, would not make that connection or agree with its implications. His insights, though, correspond strikingly to a Christian perspective of the ongoing creative work of the Spirit within the cosmos, a cosmos best viewed holographically and governed by information that has its source in God.

We have already seen how superposition works on the microcosmic scale of things. The Copenhagen theory holds that a quantum reality exists in the virtual state of a 'probability wave'. It constitutes a superposition of wave-like and particle-like properties. Most physicists who work with this theory assert that the probability wave or (mathematical) wave function is actualized or rendered 'real' when it collapses under the influence of an observer. With that collapse a material reality emerges that is no longer in a superposition of states. Superposition can generally be thought of as two apparently contradictory states existing simultaneously as an 'entangled whole'. Before it is subject to measurement, a quantum is both wave and particle; its spin is both positive and negative, both up and down; and, like Schrödinger's imaginary cat, it can be, as it were, both 'dead' and 'alive'. That is, it exists in a way totally unlike ordinary macrocosmic objects, which can assume only one state at a time. In the macrocosm, a water wave cannot be a pebble nor a pebble a wave, just as in binary notation a bit must be either 0 or 1, but never both at once. What will enable quantum computers to work at astronomical speeds compared to today's clunkers is the fact that units of information will be expressed as both 0 and 1. In the Information Age, that is, superposition will undoubtedly carry the day! It will no longer be a concept limited to the microcosm but will be seen to characterize macrocosmic events and realities as well.

We should note, however, that among themselves physicists use the term 'superposition' in a more technical way. It refers, once again, to the wave-like aspect of quantum phenomena that exist in a probabilistic blending of seemingly contradictory or incompatible states. Those phenomena or quantum entities can be actualized by observation, which destroys their coherence and reduces them to a single actual state. Interference peaks in the double-slit experiment are superposed, for example, as are the waves created by the pebbles we dropped into a pond. In quantum information processing, the qubits also exist in a superposition of states (0 and 1).

This is all rather straightforward. If we look for a more complete definition of the concept, we run into statements like this, taken from *Wikipedia*: 'The linear combination of two or more eigenstates [of a physical quantity] results in a quantum superposition of two or more values of the quantity'. To a physicist, this makes perfect sense. To most people it is about as intelligible as the classic 'conversation stopper'

from an old *Mad Magazine*: 'I had one grunch but the eggplant over there'! For the truly intrepid, we can mention Huygens' principle of superposition: 'The displacement of any point due to the superposition of wave systems is equal to the sum of the displacements of the individual waves at that point'. This too is quite intelligible if we parse it carefully enough.

A simpler example, however, takes us back to Heisenberg's indeterminacy principle. You recall that this principle states that at a given moment in time it is impossible to specify exactly both the momentum and the position of a quantum particle. If we determine the precise value of the particle's momentum, for example, then its location is inevitably thrown into a superposition of two or more states, and determination of its exact value is impossible. In fact, once the particle's momentum is determined, we have to accept that *it has no location*! It conforms to the indeterminacy (and the weirdness) inherent in all conjugate variables: when its momentum is precisely determined, the particle simply has no definite position; and vice versa, precise determination of its position means it has no actual momentum.

To grasp this a little better, let us go back to that *Wikipedia* definition. An 'eigenstate' or 'eigenvalue' of a given physical quantity (e.g., momentum or position) refers to the intrinsic state or value of a system. (The terms are derived from the German *eigen*, 'own' or 'proper to', meaning 'the precise value' of something.) Because of the indeterminacy inherent in any quantum system, either position or momentum can be determined precisely at any given moment, but not both at once. If we sacrifice precision regarding position, then we can determine the 'inherent' or characteristic value of momentum, and vice versa. That determination gives us its eigenstate, with a specific eigen-value or number-value. This occurs, remember, not because specifying one quantity, e.g., momentum, somehow hides information as to the particle's actual location—as Heisenberg thought—but because once the eigenvalue of its momentum is determined, the particle simply has no position; that quantity does not exist, except in terms of Paul Dirac's so-called q-numbers, which express probabilities.

If we combine in linear fashion two or more eigenstates of a given physical quantity we arrive at a quantum superposition of two eigen-values (for example, the quantum is in two or more locations at once). This paradoxical mix of states is crucial for the phenomenon of teleportation. The Swiss physicist Nicholas Gisin and his team have done ground-breaking work in this area. As frivolous as it may seem, the link between superposition and teleportation can be well described by means of a limerick:

Hymn of praise (doggerel) in honor of Prof. N. Gisin

The conundrum of teleportation
Meant for physics a constant frustration,

'Till a guy from Geneva
Was able to achieve a
Quantum transfer of new information.

A couple of photons entangled
Gave rise to something newfangled:
A theory that 'here'
Means really it's 'there',
Leaving Newton's worldview quite mangled!

To the great disappointment of *Star Trek* fans, we will probably never get to the point where Scotty can literally 'beam up' somebody. But Gisin and his colleagues managed to transport a photon some twenty-five kilometers, so that its quantum state was preserved and its information could be stored in a crystal. In 2017, Chinese physicists were able to establish quantum communication over a distance of some 1200 kilometers, using entangled photons. And the following year other physicists managed to achieve two-way communication with a single photon! Thanks to their work and that of others, the door is now open to the practically limitless teleportation of information (despite contrary interpretations of the 'no-communication theorem'). Entanglement, as a special case of superposition, plays a crucial role in all of it.

The principle of superposition postulates that a quantum object is in all possible states until it is observed or measured. Like the wave-particle duality, superposition 'decoheres' by observation. Once measured, the wave function of the object in question collapses, and 'all possible states' are reduced to a single eigenstate with a single eigenvalue. It is, as it were, 'actualized' so that it is no longer in a superposition of states. Once the box was opened and its contents were observed, Schrödinger's cat was either dead or alive, but it was not (one could say it was no longer) both at once.

For our purposes, then, we can think of superposition as the linear combination of two or more states or values that are, or seem to be, logically contradictory or inconsistent with one another (cat dead *and* alive, spin up *and* down, polarization horizontal *and* vertical, etc.). Now we have to ask, what is the relationship between superposition and entanglement? Are they identical, or do we need to make a distinction between the two? Theorists have pointed out that all entangled states involve superposition, but the reverse is not true: not all superposed states imply entanglement. From another point of view, entanglement involves two or more separated quanta and the instantaneous transferral of information from one to the other. This non-local transferral does not involve the loss of information, because the two entangled quanta act as a single system, a single entity. Loss of superposition, though, does entail a loss of information. This occurs, for example, with the collapse of a wave function and the transition of a 'wavicle' into a specific particle.

With the loss of superposition, the wave-like aspect of a quantum is lost, and with it there is a loss of information.

Because of this difference, the examples of paradoxical elements of Christian faith I want to mention might better be described as analogous to entanglement rather than to superposition. (And the term 'similitude' might be more appropriate than 'analogy'.) There is no loss of information involved, and the two or more entities or states act as a single entangled reality. The relationship between the various entities is also permanent, independent of time and not susceptible to decoherence. Superposition is still a useful image to use with these analogies, though, since they are based on the combination in a single 'system' of apparent opposites or irreconcilable factors. Nevertheless, beware! We are not talking here about what has been known as *analogia entis*, an 'analogy of being' (the idea that the 'being' of the created world offers analogies to the being or reality of God). Nor are we interested in this context in the argument put forth by Karl Barth that rejects *analogia entis* in favor of an *analogia fidei*, an 'analogy of faith' (referring to the ultimate authority in religious belief, usually expressed in creedal statements or as Scripture itself).

The Orthodox position on analogia is quite different from that of either Protestant or Catholic theology. The question at issue is what is termed *theōsis* or 'deification', meaning our participation in the life of God. We cannot properly speak of the 'being' of God, because God is 'beyond being'. (When the term seems unavoidable, we can write it with a capital 'B' to signify the difference between created and uncreated reality). Not even the quality of 'existence' can be attributed to God, since he is 'beyond existence', as its Author and End. The 'Being' or inner essence of God is utterly beyond any possibility of 'participation' by anything created. That essence remains wholly transcendent, unattainable, and unknowable. Yet God does make himself 'participable' (to use a good French word that ought to exist in English). He renders himself accessible and, to that extent 'knowable'. Speaking of the reconciliation between Jews and Gentiles in Christ, St Paul declares that 'in him [Christ Jesus] we both have access in one Spirit to the Father' (Eph 2:18).

In Orthodox Christian thought, that possibility for 'access' to divine Life—for participation in God and knowledge of him—is given through what the patristic tradition (particularly the fourteenth-century theologian Gregory Palamas) terms *energeia*, the 'divine Energies'. These can be thought of as 'attributes' of God, such as wisdom, goodness, holiness (in the sense of 'separateness'), omniscience, omnipotence, righteousness, justice, and love. To these we have to add the attribute, suggested by the Russian philosopher Nicholas Berdyaev, of 'inexplicable Mystery'. Arguments have been made that the divine energies are ontologically distinct from the divine essence. This is a misunderstanding that could all too easily lead to polytheism. We cannot even say that the distinction between the three Persons of the Godhead is ontological. Father, Son, and Spirit are united in the very same 'essence', and in all respects they share the fullness of their transcendent Being. The same must

be said for the divine energies: they are manifestations within creation of the God who, in his innermost essence is and remains utterly transcendent relative to any created reality. God *ad intra*, God *ad extra*: that may be the ultimate superposition!

Superposition in Elements of Faith

Ontologically, 'heaven' and 'earth' exist in totally different spheres or realms, with no apparent connection between them. Yet God is both transcendent and immanent, totally beyond the world and totally present to it. In the Persons of the Risen Christ and the Holy Spirit, God is intimately involved in every human life as he is in the world as a whole, both microcosm and macrocosm. Somehow we have to grasp this (superposed!) duality, if we are to move beyond popular images of a God who, as J.B. Phillips put it, is 'too small'.

A first example would be that of the *Holy Trinity*, which is intrinsically both One and Three. This is a transcendent example of Aristotle's Platonic image of 'one over many', a 'superposition' that foreshadows the binary character of a qubit, both zero and one. As we have seen, Christian doctrine holds that the Godhead comprises three Hypostases or Persons in a single divine reality, 'one in essence and undivided'. A question that throughout the centuries has to a certain extent distinguished Eastern from Western Christianity (Orthodoxy, and Latin or Roman Catholic theology) is which one of these qualifications, 'oneness' or 'threeness', predominates? An over-simplification has long held that the East begins its reflection with the Three Persons of the Godhead to arrive at their essential Unity, whereas the opposite is true in the Latin West. There, it is said, one begins with the fundamental Unity of God and proceeds toward discernment of the Three Persons. Orthodox theologians will point out that revelation begins and ends with disclosure of the *personal* quality of God. The New Testament presents us first with the person of Jesus of Nazareth, who is sent by 'God the Father', then baptized, filled, and directed by the Holy Spirit.

It is only through meditation on the sacred writings that the essential unity which, a-temporally and non-locally, binds the Three together becomes manifest. That meditation on the 'mystery' of the Three Persons is deepened by prayer, together with participation in the sacraments and communal worship. The end of such an inner, spiritual journey is communion with God that has proceeded along two paths at once. On the one hand, the Spirit inspires a *lectio divina* or 'spiritual reading' of the Biblical sources, which draws us into communion with Christ, and through Christ, the eternal Son of God, into communion with God the Father (e.g., Jn 3:16–17; Phil 2:5–11; Heb 1;1–3).

On the other hand, readers who open the New Testament for the first time encounter initially the person of Jesus of Nazareth (if, that is, they can make their way past the intimidating genealogy that St Matthew presents at the beginning of his Gospel). Jesus then reveals the presence and purpose of God his 'Father', and

subsequently he describes the work of the Spirit as the source of regeneration and conveyer of Truth within the Christian community (a theme developed especially in John 14:26–27 and 16:13–15). These two pathways—from Spirit to Son to Father, and from Son to Father and Spirit—co-exist. Like the relationship between the divine Persons, they constitute a single 'way', a single 'spiritual system'. The truly paradoxical character of revelation is its presentation of Three Persons, distinct yet essentially interrelated, who constitute a single, undivided Godhead. Because there is here what we might call a 'spiritual entanglement' or 'superposition', it is possible to assert unambiguously and unreservedly that Christians, like Jews and Muslims, believe in and worship *One God* and One God only.

A second analogy between the quantum world and Christian faith concerns the *divine-human nature of Christ*, the eternal Son of God. This is probably the clearest example in Christian doctrine of a paradoxical analogy with entangled or superimposed systems. (Rather than speak of paradox, by the way, it would be better to use the patristic term 'antinomy'. As the Greek roots of the word indicate, an antinomy expresses a reality that breaks the laws of logic: anti-nomos, 'against the law of reason'). 'Orthodox' Christians of any ecclesial tradition maintain that the man Jesus of Nazareth is also and 'wholly' the eternal Son of God. In the words of the Nicene-Constantinopolitan Creed (325/381 AD), Christian belief is in 'one Lord Jesus Christ, the only-begotten Son of God [*monogenēs*, Jn 3.16], begotten of the Father before all ages [aeons], Light of Light, true God of true God, begotten, not made, being of one substance [essence] with the Father….' The language used to specify the nature of the Son of God—uncreated, eternally generated by the Father and sharing the Father's very essence or nature—makes clear the intention of the theologians of the first two Ecumenical Councils to declare unambiguously that Jesus is at one and the same time human and divine. He is one in essence with the divine *Archē* or unique Principle of all that exists, both visible and invisible. In a word, the man Jesus is himself God.

This affirmation is firmly grounded in Scripture. In the so-called 'Christ-hymn' of Philippians 2:5–11, for example, the apostle Paul describes the pre-existent Son of God as being in the *morphē* or 'form' of God, and through his *kenōsis* or self-emptying he assumed the *morphē* of human beings. As the context makes clear, the term *morphē* is equivalent to 'essence' or 'nature'. Consequently, the passage served as a key witness behind the Church's later designation of Jesus Christ as the 'God-man'. According to the confession of the disciple Thomas (Jn 20:28), the resurrected Jesus is both 'Lord' and 'God'. The term 'Lord' (*kyrios* in Greek) is the name of 'God' throughout the Old Testament. This confession by Thomas is the clearest affirmation in all of the New Testament that Jesus, from his conception through his ascension, is God incarnate. 'God before the ages', He is also 'God in the flesh' (Jn 1:14), who assumes fallen and corrupt human nature, without himself being subject to sin (Heb 4:15).

From a particular theological perspective, it can also be said that the Son of God is the divine *Anthrōpos*, the archetype of human existence. From all eternity he is the living Icon of 'true humanity', human nature as it was originally intended to be. By his incarnation he 'actualizes' that humanity from its original 'virtual' state by assuming physical existence as Jesus of Nazareth. He renews mankind by incorporating ('embodying') that nature into himself and restoring to it its original fullness and beauty. By his resurrection and exaltation, the eternal Son of God raises transformed human nature with and in himself, so that human persons might share fully in his life and his glory. (This is beautifully spelled out in Paul's letter to the Ephesians, 3:14–19, and in the 'Christ-hymn' of Colossians 1:13–23. The hymn proper is verses 15–20.)

As with the image of the Trinity, we have in the image of the incarnate Son a veritable superposition of states, in this instance human and divine. (We can only speak of conceptual 'images' since human language can never fully express 'divinity'.) In the former case three personal realities 'beyond being' are united in a single unique Essence; and in the latter, two essences or natures (human and divine *ousiai*) are united in a single unique Person, characterized in the language of the fifth-century Council of Chalcedon as 'without division, confusion, separation or change'. And both images, like quantum entanglement, are characterized by non-locality. The realities these images depict exist 'in all possible states,' unbounded by time and space. They are 'eternally present': here, there, and everywhere. In the language of popular piety we can say that in and through each of these realities, the Holy Trinity and the Incarnate Lord, heaven and earth coalesce to provide the matrix or framework in which God works out the salvation of his world. In this light it can also be said that the phenomenon of entanglement is of divine origin. In its original form it characterizes the inner dynamic of the Godhead, and its manifestation within the created order is merely derivative. The creation, in other words, is 'shaped' in the image of its Creator!

Similar examples of contradictory or incompatible conditions, existing in a single 'superposed' state, abound in the New Testament and in the theology of the Church. We can note a few as follows:

—God is wholly unknowable, incomprehensible to human thought and inexpressible by human language. Yet this same God reveals himself ceaselessly, through his Word (revelation through the historical Jesus, in Scripture, and by proclamation of the Gospel) and through his presence in the creation ('natural theology,' based on reason and experience). This can be thought of as a superposition of apophatic and cataphatic pathways toward knowledge of God.

—The condition of human existence: the human being is simultaneously marked by sin and bearer of the divine Image; humankind is both 'fallen' and 'deified'. This is more than *simul iustus et peccator*, the Lutheran affir-

mation that man is both righteous and sinful. 'Justification' in that context is often conceived as 'imputed', which in some interpretations amounts to a legal fiction: Christ's righteousness is attributed to us, and we are thereby acquitted, although we remain sinful. This Protestant perspective, from an Orthodox point of view, focuses too heavily on divine Justice and the removal of guilt. In an extreme form, to avoid any sort of 'works-righteousness', it neglects or denies the role of 'works of love' as essential components of the Christian's spiritual journey. We are not *saved* by our works or accumulated 'merits'; there the Orthodox and Reformed traditions are in full agreement. But to Eastern Church tradition, such works are a necessary element in the ongoing spiritual struggle to attain salvation and eternal life (Eph 2:8–10). Many Lutherans and other Protestants, of course, would agree, given the fact that so many devote themselves selflessly to works of charity.

The contrast between these two states, fallen and deified, is even more evident in Latin theology, which speaks of 'original sin' as a kind of genetic disease, transmitted (as Augustine might claim) by sexual union, that infects the life of every individual. Yet the believer, by the indwelling power of the Holy Spirit, can exist in a permanent state of grace. The Orthodox tend to speak of 'ancestral sin', but the idea is essentially the same: the Christian is both righteous and unrighteous, mired in personal corruption, yet on a spiritual journey to attain the 'likeness of God'. The superposition of these two states involves our ontology. Our very being is marked by corruption, yet the divine image in which we are created (Gen 1:26–27) is indelible, and the 'worst sinner' is called to repentance and invited to enjoy eternal participation in the life of God, a state Orthodox tradition speaks of as 'deification'.

This duality of 'saint and sinner' that characterizes human existence leads both Jesus and Paul to underscore the spiritual importance of various *aporia*, logical inconsistencies that involve contradictory superposed states: 'The first shall be last and the last first'; 'The humble shall be exalted and the exalted humbled'; 'One must lose one's life to gain it'; 'When I am weak, then I am strong'.… Finally, a striking example is found in the Orthodox Paschal Liturgy: 'Through the Cross joy has come into the world!'

—As one of the Holy Trinity, the Spirit is 'wholly other'. In his essence he is utterly beyond any created reality. At the same time, as the prayer to the 'Heavenly King' declares, the Spirit is 'everywhere present, filling all things'. He is infinitely distant, yet intimately involved in every aspect of our life. St Paul describes this mysterious Presence of the Godhead as deeply personal, helping us in our weakness and offering both for us and through us prayer and adoration to God the Father (Rom 8:26–27). Patristic tradition observes that the Spirit is the only divine Person who has no other Person to reveal him (the Father is revealed by the Son, and the Son by the Spirit). As Vladimir Lossky stressed in his magisterial work *Mystical Theology of the*

Eastern Church, the Spirit will finally be revealed in the *eschaton*, in the faces of those who constitute the Communion of Saints. As 'holy', then, the Spirit is infinitely beyond and essentially 'separate' from all created reality (this is the fundamental meaning of 'holiness'). Yet he is intimately involved in our every thought and action, filling human life with his sanctifying presence, and offering ceaseless intercession for us and for God's world. A 'spiritual superposition' of Being and Act.

—Christ, in the experience and proclamation of the Church, is the risen and glorified Lord. As One of the Holy Trinity, he, like the Spirit, is infinitely beyond the world he has made. Nevertheless, he too, as one Hand of the Father in St Irenaeus' striking imagery, is continuously present and at work within the world and in human life, to offer all things to his Father, that God might be, as Ephesians declares (1:23; 3.6), 'above all, through all and in all'. Yet significantly, the risen and glorified Christ is also and always remains 'the Crucified One'. When the myrrh-bearing women entered the tomb on the morning of the resurrection, the Gospels affirm, they found it to be empty except for the presence of an angelic messenger. This heavenly figure declared, 'You seek Jesus of Nazareth, *ho estaurōmenos*' (Mk 16:6). These Greek words are usually translated 'who was crucified'. Grammatically, however, they are a gerund that forms a substantive, a noun. Literally they must be translated 'the crucified one'. Jesus of Nazareth, crucified, raised from the dead, and glorified in the presence of God the Father, remains forever 'the Crucified One'. This, one might say, is his 'essential identity.' In him death and resurrection are united in such a way that the risen and ascended Lord is and remains the Suffering Servant, who bears the guilt, the pain and the affliction of all those who 'dwell in' him (Is 53). This is the meaning of Blaise Pascal's affirmation that I come back to again and again: 'Christ is in agony until the end of the age'. Forever crucified, forever glorified! The two constitute a single entangled state that defines both the person and the work of the Son of God.

—Christian eschatology (the doctrine of 'last things') is simultaneously 'future' and 'realized'. A debate has raged for years, especially among Protestant theologians, as to which aspect predominates. Is the 'final' act of God reserved for the end of human or cosmic history? Or is that 'end' already in some way realized, actualized? Is the 'Last Day' or the Day of Judgment an event to occur at the *Parousia*, the end-time second coming of Christ in glory, to judge the living and the dead (Mt 25:31–46; Jn 5:25–29; Rom 2:5–11)? Or is it already at hand, a present reality in the life of those who seek salvation in Christ? As a passage in John 5 indicates, it is both at once. Interpreters have often raised questions about two apparently contradictory statements in the Fourth Gospel concerning 'eternal life'. In 5:25 to 29, Jesus speaks of a time when 'those who are in the tombs will hear his voice', meaning the call

> to judgment issued by the Son of God. Then all the dead will arise, some to a resurrection of life and others to a resurrection of judgment (*krisis*). The preceding verses, especially v. 24, however, declare that 'he who hears my word and believes in him who sent me *has* [present tense!] eternal life; he does not come into judgment, but has passed from death to life'.

It is important to recognize that these two passages, verses 21–24 and 25–29, form a single literary unit, governed by the laws of 'chiasmus' or concentric parallelism. This is a rhetorical form widespread throughout the Bible and in other forms of literature, both ancient and modern. In addition to a linear reading ('from A to Z,' or from beginning to end), which we are quite accustomed to, a text structured 'chiastically' invites a second reading, from the extremities toward the center. Beginning and end are parallel to one another ('inclusion' and 'conclusion'), as are successive passages, until the reader arrives at the 'conceptual center', which is the primary point or theme of the entire text. In this case, a 'concentric reading', beginning with verses 21–23, which are in parallel with verses 25–29, reaches its climax or primary theme in verse 24. This, once again, affirms that eternal life is *now*, in the present moment, for those who accept Jesus' assertion that he has come forth from God the Father. In fact, the second passage, verses 25–29, confirms this theme. It does so by qualifying the expression 'the hour is coming' with the declaration that the hour in question, the hour of Judgment, is a present reality: 'the hour is coming *and now is*!' Jesus' words in the Gospel of John allude clearly to the Old Testament notion of a future judgment at 'the Day of the Lord', which will occur at the close of human history. This is the perspective of much of the other New Testament witness as well. But Jesus qualifies that expectation, at least in John's Gospel, with the assertion that judgment has already occurred for those who accept Jesus' witness about himself. They do not come into judgment but have already passed from death to life.

In the perspective of the Evangelist John, and in that of St Paul as well, eschatology is both present and future. It makes of divine Judgment a reality that is both actualized now and expected to come. The Christian lives these two aspects simultaneously, 'superposed' as it were, so that present and future coalesce in Christian life as a non-local state of being that is both 'now and then'. The eschatological *nun* thus defines the existential state of Christian life: past, present, and future 'collapse', as it were, into an actualized 'eternal *now*'.

Another example of a parallel—an analogy or similitude—between certain aspects of quantum theory and Christian faith concerns the nature of the Church. In the faith and experience of Orthodox Christianity the Church is both a cosmic reality and an earthly institution. Many Eastern theologians hold that the Church in its very nature is transcendent, even pre-existent relative to the rest of creation. The early Christian text *The Shepherd of Hermas*, declares that the Church 'was created before all things and it was for her that the world was made'. In this perspective the Church is 'the life of the Holy Spirit' throughout visible and invisible reality (to use

an image favored by the Russian theologian Sergei Bulgakov). It manifests itself on earth, in our experience, as an institution, with hierarchical structure, various ministries, and a 'local' presence in the form of parishes, monasteries, hospitals, and the like. But in its essence, the Church is a *non-local*, living source of 'new life', 'life in Christ', whose purpose is more than 'to increase love for God and neighbor' (as the eminent Protestant theologian H. Richard Niebuhr defined it). It is that, certainly. But its primary function or raison d'être is to foster creation of what the apostle Paul calls 'the new human being', a new creation in and by the Spirit. It is in and through the universal Church that human persons are changed into the likeness of the glory of the Lord (2 Cor 3:18), changed from our 'lowly body' to be like the 'body of glory' of Jesus Christ (Phil 3:21). By means of its proclamation of the Word of God, through its gift of sacramental grace, and by its witness of love throughout the world, the Church exists and labors for the salvation of all humankind.

Yet, as we well know, the Church is also 'institution' in a less than exalted sense. As a human organization it is marked by sin and corruption. Many of those who are ordained with the purpose of leading others to new life in Christ are guilty of the sinful abuse of their authority. Often the Church, or rather its leaders and faithful, have played hand in glove with corrupt governments, or have turned a blind eye to atrocities that it could and should have denounced, publically and furiously. The Church is also a locus of demonic activity. 'The Devil enters the church through the choir', an old adage goes. In fact, demonic influence makes its presence felt at every level of ecclesial life. And yet the Church remains Holy. Once again, two states coalesce in a correspondence, a superposition of institutional banality and corruption on the one hand and cosmic glory on the other. Western theologians have long argued about whether the Church is 'Institution' or 'Event'. Here, too, it is both: both visible, hierarchical organization and invisible source of grace and life. It requires institutional form and structures; but the Church is ultimately the 'event' of Christ's enduring presence and the sanctifying activity of the Holy Spirit. In strength and weakness, in sin and sanctity, the Church is a universal, 'non-local' reality that fills the universe and directs all things toward the single end of eternal life.

Exploring Analogy of Debates to Approach the Encounter between Orthodox Theology and Quantum Physics

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This article adopts the Analogical Comparative Theological Approach (ACTA) to explore the encounter between Orthodox theology and quantum physics. The ACTA approach integrates the intuitions of the analogical isomorphism and comparative theology methods by focusing on issues that are of high relevance for both theology and physics. The specific issues addressed here are the ones emerging within the context of two important debates: a) between St Gregory Palamas and Barlaam the Calabrian in the fourteenth century, and b) between Albert Einstein and Niels Bohr in the twentieth century. The first debate refers to some of the key aspects of Orthodox theology and spirituality. The second debate is related to the never-ending challenges of the interpretation of quantum mechanics and the nature of physical reality. The analysis suggests that the controversial issues in the two debates are deeply rooted in disagreements about the nature of knowledge, the interplay between epistemological and ontological issues, the challenges of applying logical arguments, the role of apophaticism, the challenges of knowing and the ways these challenges affect the interpretation and sharing of human experience. The discussion of the role of apophaticism is of particular interest since it shows a common need of going beyond representation, assertion and negation by focusing on the epistemological conditions of knowledge emerging through union and participation. This need is more sharply expressed in Orthodox theology where the apophatic does not emerge as a comment on representation, but as an opportunity for participation. The fundamental presupposition of the article is that one can learn a lot about theology and quantum physics by adopting the ACTA exploratory lens to examine the potential similitudes between the ways theologians and physicists debate about their ways of knowing and the challenges of articulating their personal experience with reality. One of the key benefits of the suggested approach is its ability to examine similitudes between two so different domains of human experience – one based on Divinely revealed knowledge, the other on the proactive and dialogical human engagement with the deepest layers of physical nature. The study does not pretend to be conclusive. It should be considered as part of an ongoing reflection on the value of exploring the encounter between theology and physics.

Introduction

The interaction between theology and physics usually happens as an encounter,[1] i.e. not as part of a peaceful dialogue, but a kind of co-creative confrontation and struggle. Even when they could be considered in the context of a constructive mutually beneficial interaction, theology and physics always seem to end up finding themselves engaged in a dialogical struggle. The struggle is rooted in the co-existence of a fundamental contextual difference between the ultimate directions of their existential concerns and, at the same time, of a certain similitude between their unique epistemological and linguistic challenges of dealing with the invisible, the unknown and the unspeakable. The exploration requires the adoption of an analogical comparative perspective which opens the question about the appropriate method of analysis that could result in potential scientific and theological insights. According to Michael Heller, the interface between science and theology must be based on extremely fine-tuned principles, because the "so-called 'building bridges' between science and theology without any balanced methodological care easily results in doctrinal anarchy, and even deepens the existing conflict between them."[2]

In previous studies I suggested a combination of two comparative methods as a basis for the articulation of a constructive approach to the exploration of the encounter between theology and physics: the Analogical Comparative Theological Approach (ACTA).[3] The first method is analogical isomorphism, the second – the comparative theological method. Analogical isomorphism[4] 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 a lens focusing on exploring the differences and similarities in the applications of the concepts and the unfolding of

[1] One of the meanings of the term *encounter* is "a confrontation or unpleasant struggle". The origin of the term can be found in Old French *encontrer* (verb), *encontre* (noun), which are based on the Latin in- 'in' + contra 'against': https://en.oxforddictionaries.com/definition/encounter

[2] Michael Heller, 'Where Physics Meets Metaphysics', in Alain Connes et al., eds. *On Space and Time* (Cambridge: Cambridge University Press, 2008), 238–77, 241.

[3] 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 comparative theological perspective in a science and theology context: S. Tanev, 'The Encounter of Theology with Physics: An Eastern Christian Perspective', Ch. 15 in John Slattery, ed., *T&T Clark Handbook of Christian Theology and the Modern Sciences*, (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 Gayle Woloschak & Vasilios Makrides, eds., *Orthodox Christianity and Modern Science: Tensions, Ambiguities, Potential*. Science and Orthodox Christianity Series, Vol.1, (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.

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

the relations.[5] Thus, analogical isomorphism could be qualified as a relatively "soft method" since it leaves the inquirer with a certain space for interpretation. It neither affirms nor denies the similarity between the terms, the concepts and the relations but allows to explore the interplay between comparison, distinction and analogy in shaping new insights. Analogy here is used in a dynamic and exploratory way:

> The concept of analogy belongs to the family of those concepts that being important for scientific or philosophical discourse, are at the same time fuzzy and change their meaning depending on the context. In spite of some heroic attempts, undertaken mainly by philosophers, linguists and logicians, we use them by basing them on our intuition rather than on some hard analyses. … The concept of analogy seems to be, from its very nature, multi faced and adapting its meaning to various situations. It is a dynamic concept.[6]

I have found the application of analogical isomorphism method highly valuable in exploring the parallels of the distinction between essence and energy in theology and physics.[7]

The second method is based on insights emerging from comparative theology—an emerging discipline within theology that explores the creative tension between the comparative and the theological aspects of interreligious endeavors.[8] It represents a special type of theological practice committed to deep interreligious learning while staying rooted in a specific religious tradition. Clooney emphasizes the distinctive legitimacy of comparative theology by comparing it with comparative religion, theology of religions, and interreligious dialogue.[9] In contrast to 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'.[10] In this sense, it is much more than a mere attempt to clarify the relationship between Christian faith

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

[6] Michael Heller, 'Analogy, Identity, Equivalence', in Werner Arber, Jürgen Mittelstraß and Marcelo Sánchez Sorondo, eds., *Proceedings of the Plenary Session on Complexity and Analogy in Science: Theoretical, Methodological and Epistemological Aspects*, held on 5-7 November, 2012 (Vatican City: The Pontifical Academy of Sciences, 2015), 257-267, 264.

[7] 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*.

[8] 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).

[9] Clooney, *Comparative Theology*, 15.

[10] Ibid., 15–16.

and other religious traditions by focusing on how other religions can be understood in light of the normative claims of the Christian faith.

The generative principles of comparative theology were systematically presented by Klaus von Stosch.[11] *First*, comparative theology is characterized 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.[12] *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.[13] *Fourth*, comparative theology needs the instance of a third position—an issue, a problem, or a concern that comes to 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 provide a continuous reference to the dialogue by playing the role of a controlling instance and 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 usual application of the comparative theological approach in a science and theology context should focus on a scientific issue as a third position providing a reference for the encounter of two different religious traditions. An example of one such third position could be, for example, the dominant cosmological understanding of the creation of the universe. In this sense, the usual way of applying the comparative theological approach needs to be adjusted in order to fit the context of the encounter between theology and physics. The first adjustment is that, in this case,

[11] Von Stosch, 'Comparative Theology as Challenge', 5–26. The summary of the comparative theological principles presented here follows von Stosch's logic.

[12] Von Stosch, 'Comparative Theology as Challenge', 12.

[13] Ibid., 13.

physics needs to take the place of one of the traditions — i.e., the encounter will be between the theological perspective of a specific religious tradition and the scientific understanding of a particular concept or theory. The second adjustment is that the (third) position, which provides the comparative background for the encounter, needs to be specific and highly relevant for both theology and physics. If we take again as an example the creation of the universe, the encounter will be between the articulation of the doctrine of creation in the religious tradition and the emergence of one of the dominant scientific cosmological understandings of the beginning of the universe. In this sense, the role of the third position is taken by the concept of creation itself, which is now considered from the viewpoint of the two different perspectives—the theological and the scientific one.[14]

The ACTA approach to the exploration of the encounter between theology and physics integrates the intuitions of the analogical isomorphism and comparative theology methods. In fact, the comparative theology method could be considered as an instrumental enhancement of analogical isomorphism. If properly applied, ACTA can be used to explore the relations between theology and any scientific discipline, not just physics. The question one could ask is: Why quantum physics? The answer to this question could be based on completely secular arguments in support of the so-called Primacy of Physics Constraint (PPC) principle – the methodological rule that is "observed in the history of recent science to the effect that practitioners of special sciences at any time are discouraged from suggesting generalizations or causal relationships that violate the broad consensus in physics at that time, while physicists need not worry reciprocally about coherence with the state of the special sciences."[15] According to Hellman and Thompson "Mathematical physics, as the most basic and comprehensive of the sciences, occupies a special position with respect to the over-all scientific framework."[16] PPC points therefore to the existence of a generic asymmetry: "special sciences do not relate to physics the way that it relates to them."[17]

The emergence of a special status of physics could be associated with its unprecedented progress in the nineteenth and twentieth centuries, including the explanation of new phenomena in the life sciences, chemistry, and the materials sciences. Physics is perhaps the only science that has been transforming itself over the last couple of centuries by passing through several epistemological revolutions. The last such revolution consisted in the discovery of quantum theory and the development

[14] It should be noted that the concept of creation could be explored from the perspectives of other scientific disciplines in addition to physics or cosmology, such as, for example, evolutionary biology or anthropology.

[15] James Ladyman and Don Ross, with David Spurrett and John Collier, *Every Thing Must Go – Metaphysics Naturalized* (Oxford: Oxford University Press, 2007), 38.

[16] G. P. Hellman and F. W. Thompson, "Physicalism: Ontology, determination, and reduction," *Journal of Philosophy* 72 (1975): 551–64, 551.

[17] James Ladyman and Don Ross, *Every Thing Must Go*, 39.

of quantum mechanics. The revolutionary nature of the transition from classical to quantum mechanics was determined by the fact that quantum mechanics introduced a new and relatively complete system of concepts that referred to the same type of material objects (atoms, electrons, photons etc.) by opening some completely new dimensions of reality. For example, the new conceptual system enabled the description of new physical phenomena such as the quantization of energy and wave-particle duality – the ability of quantum objects to behave either as waves or particles depending on the type of experimental setup they are investigated with. The newly discovered quantum phenomena allowed the Danish physicist Niels Bohr to speak about the emergence of a radically new situation in the understanding of micro-physical objects and, on the other hand, about the need for the adoption of a new epistemological paradigm which extends beyond the domain of quantum physics to "enlighten" other sciences. The new epistemological paradigm emerged from the need to adapt the language of classical physics in a way that would allow the description of the new phenomena emerging from the manifestation of the quantum nature of the physical micro-objects. "This epistemology is that of knowledge and conceptualization (only) in terms of effects, while it leaves the nature and character of the ultimate objects and processes responsible for these effects beyond all available knowledge or even conceptualization, and yet understood as essentially, fundamentally responsible for these effects. … Reciprocally, the existence of such irreducibly unknowable or even inconceivable objects and processes can only be inferred from the peculiar character of its effects, for example, the individual character of all effects involved and the complementary character of some of them."[18] The new epistemological paradigm enlarged the scope of traditional physical knowledge by making the ways of knowing quantum objects become part of the object of scientific research itself. 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.[19] This is what makes quantum physics a scientific discipline capable of formulating epistemological insights that are of high relevance to other disciplines and theology in particular. In what it concerns Orthodox theology, however, I will argue that this relation is not generically asymmetrical. According to Christos Yannaras the ecclesial attitude to the ontological problematics is of particular relevance since it appears to be the only one outside of the scientific domain that works from within an experiential perspective on truth. [20] The ecclesial experience is based on an apophatic attitude to language and reality that is similar to the one that has emerged within the context of modern physics. This is a perspective which

[18] Arkady Plotnitsky, *Reading Bohr: Physics and Philosophy* (Dordrecht, The Netherlands: Springer, 2006), 45.

[19] I owe this insight to my philosophy of physics University Professor Ivanka Apostolova (+2006) (Иванка Апостолова, *Физиците пред аксиологически проблеми* (София: Наука и изкуство, 1992)).

[20] Yannaras, *The Meaning of Reality*, 64.

makes modern physics and theology co-workers in the field of the human encounter with reality.

In what follows, I will apply the ACTA perspective to the exploration of the encounter between Orthodox theology and quantum physics. The adopted third position will be formulated in broader terms – the issues emerging within the context of two important debates: a) between St Gregory Palamas and Barlaam the Calabrian in the fourteenth century,[21] and b) between Albert Einstein and Niels Bohr in the twentieth century. The first debate refers to some of the key aspects of Orthodox theology and spirituality such as *Theōsis* or Deification. The second debate focuses on the still ongoing challenges of the interpretation of quantum mechanics and the nature of physical reality. As we shall see, both debates are deeply rooted in disagreements about the nature of knowledge, the challenges of knowing and the ways these challenges affect the interpretation of human experience, and the application of logical arguments. The assumption is that we can learn a lot about theology and quantum physics if we adopt the ACTA exploratory lens to examine the potential parallels between the ways theologians and physicists debate about their ways of knowing and the challenges of articulating their experience.

The debate between St Gregory Palamas and Barlaam the Calabrian

St Gregory Palamas confronted Barlaam of Calabria (c. 1290–1348) with respect to several issues, two of which were his understanding of the nature of Divine knowledge and the ways of using logical propositions about God.[22] Barlaam was a highly learned Greek monk born in Southern Italy who had moved to Constantinople to focus on studying Aristotle on the basis of the original Greek texts (he had already mastered the Aristotelian Categories and Physics, having studied them in Latin translation).[23]

[21] Georgi Kapriev, 'Gregory Palamas', in *Encyclopedia of Medieval Philosophy: Philosophy Between 500 and 1500*, ed. Henrik Lagerlund, 520–530 (Dordrecht: Springer, 2011).

[22] I am mostly relying on secondary sources to provide a reliable presentation of some the key points of the controversy in a way that will help demonstrating the application of ACTA to the encounter of theology and physics. My main sources about the debate are: 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 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 University Press, 2019). The latest contribution to this topic can be found in David Bradshaw, 'Natural Theology in St. Gregory Palamas', in David Bradshaw and Richard Swinburne, eds., *Natural Theology in the Eastern Orthodox Tradition* (St Paul, Minessota: IOTA publications, 2021), 51-64.

[23] John Romanides. 'Notes on the Palamite Controversy and Related Topics', Part I, *The Greek Orthodox Theological Review* 6 (1960–61): 193–202, 192.

In Constantinople he taught syllogistics, algebra, geometry, astronomy, music, and pretended to be one of the greatest interpreters of Dionysios the Areopagite. He was characterized as 'brilliant but sharp-tongued' and 'thoroughly versed in the classics, an astronomer, a mathematician, as well as a philosopher'. However, 'this formidable learning was coupled with an arrogant, sarcastic manner, so caustic at times that he put off even friends and allies'.[24] During the years 1333–1334, Barlaam was assigned by the Emperor to lead the negotiations with the representatives of Pope John XXII focusing on a potential agreement for union between Rome and Constantinople. He wrote twenty-one treatises against the Latins in which he opposed the primacy of the Pope and the *Filioque*—the doctrine of the procession of the Holy Spirit from the Father *and from the Son* (Filioque).

Around 1336, Gregory Palamas received copies of Barlaam's treatises against the Latins, condemning their insertion of the *Filioque* into the Nicene Creed. Although this was the position of the Eastern Orthodox Church, Palamas engaged in a critique of Barlaam's way of supporting it. Soon after that, the focus of the debate shifted from the *Filioque* to the nature and presuppositions of Orthodox theological methodology, the relationship between secular philosophy and theology, and to the question of the possibility of direct communion with the uncreated life of God.[25]

The application of logical proofs in theology

The anti-Latin Treatises written by Barlaam in 1335 to explain the Orthodox point of view attempted to offer a refutation of the use of Aristotelian logical proofs by the papal representatives in their defense of the *Filioque*. Barlaam's approach to the discussions with the Latins aimed at proving that their syllogisms are neither apodictic nor dialectic and, therefore, fallacious. In order to show the impropriety of their apodictic syllogisms about the *Filioque*, Barlaam examined whether they met the requirements formulated by Aristotle in his *Posterior Analytics*.[26] For example, in an apodictic syllogism, the premises should reveal the essence of the object and be the cause of the conclusion, but in a theological syllogism the premises cannot express the essence of God, who is unknowable. The premises must also refer to the same genus as the proposition, but there is no being that is in the same genus as God. In addition, the premises must be the causes of the conclusion, but there is no humanly conceived definition that could be the cause of any aspect of reality that is in the realm of the Divine.[27] Barlaam's approach to the refutation of the dialectic

[24] Colin Wells, *Sailing From Byzantium: How a Lost Empire Shaped the World*. (New York, Random House, 2006), 47.

[25] 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, 4.

[26] The discussion here follows the logic of Христов, '*Битие и съществуване,' 41; Христов, Византийското богословие през XIV* век, I.4.

[27] Sinkewicz, 'The doctrine of the knowledge of God', 190.

logical propositions of the Latins was based on a similar approach—he summarized Aristotle's principles on the subject and indicated how the Latin arguments did not meet their requirements. He insisted that in dialectic syllogisms it is necessary to formulate one's arguments based on opinions accepted by both opponents. This, however, was impossible since there was no agreement between the Latin and the Greek positions on the procession of the Holy Spirit.[28]

Interestingly, St Gregory himself did not start with an open critique in his early discussions with Barlaam. In his first letter to Barlaam, Palamas pointed out that he had merely been setting forth an alternative opinion and that Barlaam's view was equally legitimate — i.e., 'it was unimportant if one spoke proof in a general sense or more specifically of apodictic demonstration, so long as the truth is preserved in all its clarity'.[29] At one point however Palamas escalated the strength and the directedness of his argumentation, showing a masterful handling of Aristotelian logic in the theological domain. The reason for the escalation was an insulting remark in the first letter of Barlaam:

> Not without a touch of mockery, Barlaam opened his letter to the Athonite by saying that, if Palamas had gone off to seek the heights of contemplation and forgotten the skills of expression, he should be more careful in his criticisms, because he has in fact failed to understand the problems at question.[30]

The evidence of St Gregory's mastership of Aristotelian logic[31] suggests that St Gregory was trying to refute Barlaam in a way similar to the one Barlaam himself had used to refute the Latins—by accusing Barlaam of ignorance of Aristotelian logic.[32] According to Stamatios Gerogiorgakis, it was Gregory Palamas 'who retained a good deal of the spirit of the Aristotelian theory of demonstration. Barlaam misinterpret-

[28] Ibid.

[29] As referenced by Sinkewicz, 'Doctrine of Knowledge of God', 208.

[30] Sinkewicz, 'The Doctrine of Knowledge of God', 223.

[31] See Norman Russell, *Gregory Palamas and the Making of Palamism in the Modern Age*. Russell refers to Philotheos Kokkinos, *Discourse on Gregory*, *Archbishop of Thessalonika* 11 in: Philotheos (Patriarch of Constantinople), Dēmētrios G. Tsamēs. *Philotheou Kōnstantinoupoleōs tou Kokkinou Hagiologika erga*, Volume 4 of Thessalonikeis Vyzantinoi Syngrapheis (Thessaloniki: Kentron Byzantinon Ereunon, 1985). According to Philotheos Kokkinos, St Gregory was a pupil of Theodore Metochites, who 'distinguished himself in physics and logic—in a word, in all Aristotelian studies—so much so that … the Grand Logothete [Theodore Metochites], once in the presence of the emperor began a discussion with Gregory on Aristotle's treatment of logic, and was so struck by what he heard the youth utter that he could not contain himself or conceal his admiration but turning to the emperor in amazement said: "Even Aristotle himself, if he were present and had heard this young man, would in my opinion praise him more than a little. And I would here add … that those who study philosophical treatises, especially the complex works of Aristotle, should possess such a spirit and aptitude."'

[32] See Христов, 'Битие и съществуване,' 36–48; Христов, *Византийското богословие през XIV век*, I.4; Христов, "Естествения разум и свръхестественото озарение," 125–34. Comments on the validity of this assumption can be also found in: Gunnarsson, *Mystical Realism in the Early Theology of Gregory Palamas*, 24; 95.

ed the Aristotelian theory in many respects'.[33] According to Ivan Christov, what St Gregory did was to go beyond the typical Aristotelian substantialist understanding of logical forms by offering a specific existential interpretation. He reconsidered the ontological foundations of Aristotelian logic and demonstrated how syllogistic proofs could be applied from within an entirely theological perspective. In another publication, Julia Konstantinovsky provided a very similar interpretation:

> Palamas was as interested in and knowledgeable of Aristotelian logic as Barlaam or as any Western scholastic. Being a man of his age, Palamas used Aristotle as an intellectual framework for his own philosophical theology. Crucially, Palamas' syllogizing is at the service of Christian dogmatic theology and epistemology, and as such pursues theological purposes of its own. Palamas, therefore uses Aristotle creatively and transforms him.[34]

The argumentation of St Gregory Palamas against Barlaam focuses on a different articulation of the nature of syllogistic proofs based on the distinction between essence, being, and existence. It is no longer the Divine essence that is the subject of syllogistic proofs but those aspects of the Divine being that are open to participation—the Divines energies, life, wisdom, and providence.[35] In other words, the ground for participation is that part of the essence that is open for participation to created beings. Due to its existential orientation, St Gregory calls this part of the Divine essence 'nature'.[36] This essence or nature is the source of the Divine energies, making possible the knowledge and experience of God, and opening the possibility for an authentically theological approach to syllogistics. Causality in theological syllogisms pertains to the things around God — i.e., it is based on the reality of the Divine energies.

> The distinction between the uncreated, incommunicable divine essence and the uncreated but communicable divine energies, according to the Orthodox tradition, allows for the active and charismatic relationship between the uncreated and transcendent God, and the created world. Regarding knowledge of God's essence (*what* God is), then, the uncreated God is totally unknown to created beings, even to the saints who receive the gift of God's uncreated grace. No contact with, or knowledge of, the divine essence is possible and thus no logical demonstration can possibly be produced for it. The fact that God exists, however, as both One and Three (*that* God is, and *who* God is),

[33] Gerogiorgakis, Stamatios. 'The controversy between Barlaam of Calabria and Gregory Palamas on demonstrative and dialectical syllogisms revisited'. Philotheos 10 (2010): 157–169.
[34] Konstantinovsky, 'Dionysius the Areopagite versus Aristotle?', 313–320.
[35] Христов, 'Битие и съществуване,' 47; Христов, *Византийското богословие през XIV век*, I.4.
[36] Ibid.

> and that 'around' God are the various properties of the divine nature and hypostases, can be investigated and demonstrated. Needless to say, an obvious prerequisite for all this is the fact that God personally revealed these things to humanity within the framework of the salvific economy, renewing a charismatic relationship with humanity through the Church. The experience of life in Christ teaches that there exists the possibility of direct communion and relationship with God through God's uncreated energies. Thus, when there is contact between God and knowledge, there is demonstration.[37]

The role of philosophy in theology

St Gregory Palamas critiqued the Calabrian for both his overly enthusiastic Hellenism and his insistence on the reality of divine illumination in pagan philosophers. According to Sinkewicz, 'On the surface, there is nothing particularly shocking in this, at least not to the modern reader. Palamas, however, perceived that there was something suspicious behind these statements and attacked Barlaam regarding them'.[38]

For Barlaam, philosophy is a source of knowledge about God and 'the pagan philosophers were illuminated by God just like the Church Fathers, because the truth to be found in both philosophy and theology is one'.[39] According to Palamas, however, 'pagan philosophy can in no way lead us to an understanding of the nature of the human person created in the image and likeness of God; such an understanding is the fruit of revelation alone'.[40] That is why he was 'scandalized by Barlaam's claim that because truth is one, the products of divine revelation and human reasoning may be considered in some sense on a par with each other'.[41] Palamas was not against philosophy in general. For him there was no doubt that 'philosophy can become a divine gift if it is connected to the faith and love of God. … Reborn through divine grace, philosophy is transformed into something "new" and "divine-like", it becomes a discourse of edification, it knows and accepts the gifts of the Holy Spirit. It becomes the wisdom from above of those who "philosophize in Christ"'.[42]

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

[37] 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, 7.

[38] Sinkewicz, 'The Doctrine of Knowledge of God', 181–242, 241.

[39] Norman Russell. *Gregory Palamas and the Making of Palamism in the Modern Age*, 115.

[40] Ibid., 138.

[41] Ibid.

[42] 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, 16.

within the temporal and the created'.[43] He clearly ignored the Biblical and patristic distinction between created and uncreated, as well as the direct revelatory presence and activity of God in the history of the Church and humankind in general. 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.' On the basis of such created representations, the soul rises through philosophy toward the immaterial archetypes which constitute perfection and the fullness of *theognosia*. Barlaam… denied methodologically the empirical basis for *theognosia* because he rejected the uncreated presence and participation of God, especially, in the liturgical and ascetic life of the Church.[44]

According to Barlaam, there can be no contemplation of a divine light per se because the only light that can be contemplated by the intellect is related to the knowledge of creatures or "the knowledge expressed in words."[45] And the knowledge possessed by the mind remains always associated with rational discourse.[46] This relationship between Divine knowledge, knowledge about creatures, and the language expressing them was a point that became the subject of Palamas' criticism.

Language, apophatic theology and experience of God in the Holy Spirit

St. Gregory accuses Barlaam for claiming that "there is nothing above knowledge"[47] and that it is only "spoken knowledge" that is light.[48] According to St. Gregory there are two philosophies, a philosophy in words and another in deeds, and that there are "many and various differences" between them.[49] He sees 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 in 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 the level of the knowledge of created beings. That is why the monks

[43] Ibid., 16–17.
[44] Ibid., 17.
[45] Gregory Palamas, *The Triads*, II, 3.71. The quotations from the Triads provided here are a translation by Scott Pentecost, *Quest of the Divine Presence: Metaphysics of Participation and the Relation of Philosophy to Theology in St. Gregory Palamas' Triads and the One Hundred and Fifty Chapters*. PhD dissertation (Washington, DC: Catholic University of America, 1999).
[46] Gregory Palamas, *The Triads*, II.3.35.
[47] Gregory Palamas, *The Triads*, II.3.11.
[48] Ibid., II.3.71.
[49] Ibid., II.1.21.

"did not think it fit to call him a contemplative."[50] The 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."[51] 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."[52] "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."[53] 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, to discursive thought and to words related to natural phenomena.[54] "The philosopher teaches that the knowledge we have from creatures is the most perfect vision of God"[55] 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.'"[56]

The discussion of the relationship between apophatic theology and the experience of God is an important issue in the context of the present study. In a recent reflection on 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'.[57] … Firstly, what defines apophaticism is not attributing 'negativity' to God —which is, in fact, a paroxysm of affirmation— but the relative character of both assertion and negation. Secondly, the interpretation of the notion in question —just like in the case of any testimony to tradition—cannot be lured to an a priori category; on the contrary, it takes on full meaning and validity only from

[50] Pentecost, *Quest of the Divine Presence*, 61.
[51] Ibid., 62.
[52] Gregory Palamas, *The Triads*, I.3.17.
[53] Ibid., II.3.15.
[54] Pentecost, *Quest of the Divine Presence*, 63.
[55] Gregory Palamas, *The Triads*, II.3.67.
[56] Pentecost, *Quest of the Divine Presence*, 69, referring to *The Triads*, II.3.76.
[57] V. Lossky, *The Mystical Theology of the Eastern Church* (St. Vladimir's Seminary Press: Crestwood, NY, 1976), 39.

its connection to the other historical testimonies of tradition and, above all, from an 'ecclesiastical' experience that is alive and dynamic.[58]

In an insightful reflection on the theological contributions of St Symeon the New Theologian, Nikolaos Loudovikos describes his times as characterized by an estrangement from God emerging from the identification of the contemplation in the Holy Spirit with the scholastic "reworking of meaning in the mind."[59] The context is different but the understanding of apophaticism manifests an impressive similarity with the arguments of St Gregory Palamas:

> 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; and not only the mysteries about Himself but also the great part of His works are unknown to all.'[60]
>
> It is union, therefore, as communion in existence, which gives rise to apophaticism. It is not the apophatic as a comment on representation, but 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.[61]
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> According to Gregory Palamas, *Theognosia*

[58] Federico Aguirre, 'Theological Apophaticism and Philosophical Nihilism, Towards a Theory of Knowledge', *Teología y Vida* 60.2 (2019): 229-242, 231.

[59] Nikolaos Loudovikos, *Analogical Identities: The Creation of the Christian Self, Beyond Spirituality and Mysticism in the Patristic Era* (Turnhout, Belgium: Brepols Publishers n.v., 2019), 91.

[60] Ibid., referring to Symeon the New Theologian, *Hymns* 3.261.

[61] Ibid., 92.

> … 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.[62]

We can see how 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 Tabor.[63] Fr John Romanides explicitly pointed out the Latin theological point of departure of the Calabrian monk.[64] 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 that is not an objectively given reality that can be perceived by anyone present, because its vision requires the transformative effect of the Divine grace and energies. A reference to 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 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

[62] 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.

[63] 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).

[64] John Romanides, 'Notes on the Palamite Controversy and Related Topics', Part I, *The Greek Orthodox Theological Review* 6 (1960–61):193–202, 194.

> 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.[65]

In this passage, St Gregory referred to St Maximus the Confessor to emphasize that it was actually Christ's disciples who were transfigured by the Spirit and made able to see his divine glory.[66] In addition, he relates the experience of the apostles to the experience of Moses:

> Everything about the blessed divine nature is truly beautiful and desirable, and is visible only to those whose minds have been purified. Anyone who gazes at its brilliant rays and its graces, partakes of it to some extent, as though his own face were touched by dazzling light. That is why Moses' countenance was glorified when he spoke with God (Exod. 34:29). Do you observe that Moses too was transfigured when he went up the mountain and beheld the Lord's glory? But although he underwent transfiguration, he did not bring it about, in accordance with him who said, 'the humble light of truth brings me to the point where I see and experience God's radiance'.[67]

A necessary condition for the theophanic experience is that the visionary is in the proper state of soul under the influence of grace.[68] 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. The Spirit who rests upon Christ and his humanity rests as well on those who are gathered in the Body of Christ – the Church.

> It has always been the Orthodox judgment that union with Christ can be lived only in the Holy Spirit, and that the experience of being in the Holy

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

[66] 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'.

[67] St Gregory Palamas, 'Homily Thirty Four', 271. In this passage, St Gregory refers to St Gregory the Theologian's *Oration on the Holy Theophany, that is to say, On the Birth of Our Saviour* XXXVIII.

[68] 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.

> Spirit is nothing other than union with Christ. The more vividly one knows Christ and the more one comes to live in him, the more one knows and lives in the Holy Spirit. The more spiritual a life one leads the more lovingly is one bound to Christ.[69]

In this sense, the spiritual empowerment enabled by the Holy Spirit is both Christological and Trinitarian. It is the Trinitarian divine activity that transforms or transfigures the sight of Moses and of the Apostles, originating from the Father, through the Son, in the Holy Spirit, so that they could start seeing this same Light according to the degree of their receptivity, and according to the divine will for them. It is, however, Christ himself who appears in the theophanies, since it is him who sends the Spirit from the Father, he is the one in whom all things were created and hold together.

The debate between Albert Einstein and Niels Bohr

Classical vs quantum epistemology

Quantum physics began challenging the epistemology of classical physics in the beginning of the 1920s and resulted in the famous debate between Albert Einstein and Niels Bohr. The key issues in the debate are still reverberating and it was just in the last quarter of the twentieth century that modern physics experiments demonstrated that the fundamental issues in the famous Einstein-Bohr debate have been resolved in Bohr's favor. The outcome of the debate was the disclosure of a profoundly new relationship between the parts and whole of physical entities, which is completely 'non-classical'. This new relationship suggests that the classical conception of the ability of a physical theory to disclose the whole as a sum of its parts, or to describe reality-in-itself, is no longer acceptable. Modern physics experiments have made it perfectly clear that these assumptions of classical physics are no longer valid.[70]

The uncertainty principle and the problem with visualization

It took more than two decades after the discovery of quantum physics before it became possible to formulate a theory that was similar in functioning to Newtonian mechanics. Quantum mechanics was introduced in 1925 and 1926 by Schrödinger and Heisenberg in two different but mathematically equivalent versions. Schrödinger suggested his equation in 1925 as a description of the idea of the French physicist

[69] Dumitru Staniloae, 'Trinitarian Relations and the Life of the Church', in Dumitru Staniloae, *Theology and the Church*, tr. Robert Barringer (Crestwood, NY: St. Vladimir's Seminary Press, 1980), 14.

[70] Robert Nadeau and Menas Kafatos, *The Non-Local Universe: The New Physics and Matters of the Mind* (Oxford: Oxford University Press, 1999).

Louis de Broglie that all quantum particles could behave like waves. Schrödinger's equation ascribed to a particle a wave function (denoted ψ and called also the ψ-function) from which the particle's future behavior can be predicted. The wave function was a purely mathematical expression, not directly related to anything observable.[71] It soon "evolved into the notion of 'quantum state' ψ, endowing it with heavy ontological weight. This conceptual step was wrong, and dramatically misleading. … The idea that the quantum state ψ represents the 'actual stuff' described by QM has pervaded later thinking about the theory. … To be fair, Schrödinger himself realized soon the problems with his early interpretation, and became one of the most insightful contributors to the long debate on the interpretation; but the misleading idea of taking the 'quantum state' as a faithful description of reality stuck."[72]

Heisenberg's version of quantum mechanics was presented in virtually non-classical terms and led to the formulation of the so-called *uncertainty principle*.[73] When applied to a particle, Heisenberg's uncertainty principle means that having more precision in measuring the particle's position leads to less precision in measuring its velocity, and vice versa. We cannot see the quantum object, we cannot point to its specific position, speak of its specific trajectory, or see it moving from point A to point B. We can just evaluate its chances of being in a specific space region. The emergence of the new situation could be described as part of the apophatization of quantum theory, i.e. its growing challenges of using classical physics language and conceptualization of physical reality.

One of the key questions was how to connect the invisible particle, or its mathematically ascribed wave function, to properties that are observable in an experiment. The first insight that opened the door to an improved understanding of the new situation came from Max Born in 1926, and it was not well received by most physicists at the time. Born adopted Heisenberg's theoretical insights and, together with Pascual Jordan, helped to articulate them in a matrix form, leading to the formulation of matrix quantum mechanics—its first conceptually autonomous and logically consistent formulation. In addition, Born argued that the amplitude of Schrödinger's wave function is related to a probability—'specifically, the probability that you will find the particle at that position if you detect it experimentally'.[74] According to the so-called Born's

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

[72] Carlo Rovelli, 2018 'Space is blue and birds fly through it', *Philosophical Transactions of the Royal Society* A 376 (2018): 1-13, 2. http://dx.doi.org/10.1098/rsta.2017.0312.

[73] Werner Heisenberg, 'Über quantentheoretische Umdeutung kinematischer und mechanischer Beziehungen', *Zeitschrift für Physik*, 33.1 (1925): 879–893. An English translation can be found in B. L. van der Waerden, trans., ed., *Sources of Quantum Mechanics* (New York: Dover, 1968), 261–276.

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

rule, this probability is provided by the square of the wave function: ψ^2. Thus the new theory provided the probability of locating a particle within a specific region and the range of velocities that characterize its movement. What greatly disturbed physicists was that Born's definition of the term probability did not refer to the behavior of a system in a way that could be described in classical terms. He was referring to an inherent measurement aspect of all quantum mechanical events, which considered their behavior probabilistic by nature and did not allow to predict precisely where a particle would be observed no matter what improvements were made in both theory and experiments. The radicalness of Born's proposal consisted in the fact that

> [i]n 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 Born, the wave function is not like this. It's 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 not so much the Born rule as a way of computing probabilities,' … 'but the fact that we cannot interpret the measurements as revealing some pre-existing properties of the system.' What's more, the mathematical machinery for unfolding these probabilities can only be written down 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.[75]

The principle of complementarity and the breakdown of classical logic

The particle-like understanding of light emerged after Planck's discovery of the quanta, primarily due to Einstein's explanation of the photoelectric effect. It was around 1920 when light 'acquired' in physics an explicitly dual, i.e. wave-particle, character that was unexplainable by the existing laws of classical physics. Almost at the same time the pervasive 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.

It is quite significant that the point at which mathematical theory meets the realm of the un-visualizable is exactly the point at which classical logic breaks down as well. This required a new logical framework that was originally developed by Niels Bohr in an effort to explain wave-particle dualism in quantum physics.[76] The mutual exclusivity

[75] Ibid.

[76] 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 View-

of 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. 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 quantum nature of physical reality requires a new logic and new epistemology.[77] The need for the new logical framework was based on the fact that, in addition to the need to represent the opposition of two 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. Such framework does not only refer to the measurability or knowability of the properties of an object but, more importantly, it accounts for the limitations of the actualization and manifestation of these properties in the physical world. Thus, the character of physical reality is determined by the ways of energetic manifestation of its properties, which are limited by the trade-offs between the two aspects of its dual wave-particle nature. The emergence of complementarity in a quantum system occurs when one considers the specific circumstances under which we attempt to observe or register its properties. As Bohr noted, the principle of complementarity 'implies the impossibility of any sharp separation between the behaviour of atomic objects and the interaction with the measuring instruments which serve to define the conditions under which the phenomena appear'.[78]

In what way exactly the principle of complementarity does not conform to classical logic? The problem 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 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 the same entity that contradictions 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'.[79]

point of Complementarity', in: Michel Bitbol, Pierre Kerszberg, Jean Petitot (eds.), *Constituting Objectivity, Transcendental Perspectives on Modern Physics* (Berlin: Springer Science + Business Media B.V., 2009) 301–316, 314.

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

[78] Niels Bohr, 'Discussion with Einstein on Epistemological Problems in Atomic Physics', in *Albert Einstein: Philosopher-Scientist*, ed. Paul Arthur Schilpp, 199–241 (Evanston: The Library of Living Philosophers, 1949), 210.

[79] Ibid., 115–16.

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 in one out 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 personal engagement of the observer, resulting in a specific experimental design. In other words, one could not speak anymore of objectively existing properties of quantum objects independently of 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 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.'[80]

Albert Einstein vs Niels Bohr

The famous debate between Bohr and Einstein began at the fifth Solvay Congress in 1927 and continued until Einstein's death in 1955. The argument took the form of a discussion of thought experiments in which Einstein would try to attack the validity of Heisenberg's uncertainty principle by demonstrating that it was theoretically possible to simultaneously measure, or at least determine, the precise values of two complementary constructs in quantum physics—position and velocity. Bohr would then respond with a careful analysis of the conditions and the results of the thought experiments and demonstrate that there were fundamental ambiguities Einstein had failed to resolve.[81]

Einstein eventually accepted Heisenberg's uncertainty or indeterminacy principle. He, however, never really entered the discussion of the principle of complementarity.[82] The essential point of subsequent disagreement in the debate became 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

[80] N. David Mermin, 'Physics: QBism puts the scientist back into science'. *Nature* 507 (2014): 421–23: https://www.nature.com/news/physics-qbism-puts-the-scientist-back-into-science-1.14912.

[81] An insightful discussion of the nature of the debate between Einstein and Bohr can be found in: Robert Nadeau and Menas Kafatos, *The Non-Local Universe: The New Physics and Matters of the Mind* (Oxford: Oxford University Press, 1999), 162.

[82] N. P. Landsman, 'When champions meet: Rethinking the Bohr–Einstein debate', *Studies in History and Philosophy of Modern Physics* 37, 212–242, 217.

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'.[83] 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, a one-to-one correspondence between every element of the physical theory and the physical reality.

Bohr agreed that the existing theories may and will improve with 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 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 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. This transfer requires a terminological adjustment. All terms now apply to certain physically complex and apparently non-localized entities, each involving the whole experimental arrangement, rather than to single physical entities that are narrowly localized in space. In Bohr's view, there is no God-like perspective from which we can know physical reality in

[83] Letter to Max Born (December 4, 1926), in Max Born and Albert Einstein, *The Born-Einstein Letters*, transl. 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'.

itself. Thus, we are forced to recognize that our knowledge of physical reality is in principle local and, therefore, incomplete.

Bohr's way of expression, especially in the early stage of the development of quantum mechanics, did not help much in providing 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, Paul Ehrenfest wrote to him in a letter from 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'.[84] The point here is that Bohr appeared to struggle with finding the proper language to talk about the emerging quantum theory. One could, however, look at Bohr's struggle in another way. 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'.[85] Heisenberg's view provides another indication for the existence of a process of apophatization that quantum physics was, and still is, undergoing.

A more balanced approach to the interpretation of the debate

According to a recent interpretation of the debate between Einstein and Bohr suggested by N. P. Landsman,[86] in the early stages of the debate Bohr was the undisputed winner. However,

> after decades of derision by the Copenhagen camp, Einstein's star as a critic of quantum mechanics has been on the rise since about the early 1980s. … Bohr's reputation as an interpreter of quantum mechanics seems to be travelling in the opposite direction. During his lifetime, Bohr was revered like a demi-god by many of his contemporaries, certainly because of his brilliant pioneering work on quantum theory, probably also in view of the position of inspirer and even father-figure he held with respect to Pauli (who seems to have been Bohr's greatest admirer) and especially Heisenberg.[87]

[84] 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.

[85] Ibid.

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

[87] Ibid., 214.

While most of the presentations of the Einstein–Bohr debate closely follow Bohr's perspective,[88] Landsman agrees with Beller (1999)[89] that 'Bohr's account was written from a winner's perspective, concentrating on parts of the debate where he indeed emerged victorious, if not "triumphant"'.[90] Things seem to be changing after a recent reevaluation of the importance of the so-called EPR (Einstein, Podolsky, and Rosen) paper[91] to the extent that the most recent critique of Bohr's position has become extremely biased and even intellectually embarrassing.[92]

The EPR paper was published in 1935 to suggest a thought experiment intended to demonstrate an inherent paradox in the early formulation of quantum theory.

> The paradox involves two particles which are entangled with each other according to quantum mechanics. Under the Copenhagen interpretation of quantum mechanics, each particle is individually in an uncertain state until it is measured, at which point the state of that particle becomes certain. At that exact same moment, the other particle's state also becomes certain. The reason that this is classified as a paradox is that it seemingly involves communication between the two particles at speeds greater than the speed of light, which is a conflict with Einstein's theory of relativity.[93]

As Landsman pointed out, 'EPR was really a confused and confusing mixture of Einstein's earlier attack on the uncertainty relations with his later "incompleteness" arguments against quantum mechanics' but, at the same time, 'the immediate response to EPR by the Bohr camp reveals their breathtaking arrogance towards Einstein's critique of quantum theory'.[94] Bohr and his supporters did not see in this paper any new relevant arguments against their position and kept bluntly applying their previous logic in refuting it. According to Landsman, they did that 'with an obscurity surpassing that of EPR' but, more importantly, 'this attitude must count among the most severe errors of judgement in the history of physics'.[95] This is because EPR has become

[88] Niels Bohr, 'Discussion with Einstein on epistemological problems in atomic physics', in P. A. Schilpp, ed., *Albert Einstein: Philosopher-scientist* (La Salle: Open Court, 1949), 201–241.

[89] M. Beller, *Quantum dialogue* (Chicago: University of Chicago Press, 1999).

[90] Landsman, 'When champions meet', 215.

[91] A. Einstein, B. Podolsky and N. Rosen, 'Can quantum-mechanical description of physical reality be considered complete?' *Physical Review* 47 (1935): 777–80.

[92] See for example Adam Becker, *What Is Real? The Unfinished Quest for the Meaning of Quantum Physics* (New York: Basic Books, 2018), 5–6, who ascribes to Bohr an antirealist philosophical view that cannot be found anywhere in his writings, neither in the writings of his closest followers.

[93] Andrew Zimmerman Jones, 'EPR Paradox in Physics. How the EPR Paradox Describes Quantum Entanglement'. *ThoughtCo.* https://www.thoughtco.com/epr-paradox-in-physics-2699186 (last accessed on May 12, 2019).

[94] Landsman, 'When champions meet', 217.

[95] Ibid.

> arguably the most famous paper ever written about quantum mechanics. For although Einstein's original intention might have been to press what he felt to be a *reductio ad absurdum* argument against quantum theory, the paper is now generally read as stating a spectacular prediction of quantum theory, viz. the existence of what these days are quite rightly called EPR-correlations. The theoretical analysis of these correlations … revitalized the foundations of quantum theory, and their experimental verification … was done in one of the most stunning series of experiments in twentieth-century physics.[96]

In other words, Einstein suggested the configuration of a quantum entanglement experiment in order to demonstrate that such entanglement was impossible, but the experiment proved the opposite (i.e., Einstein demonstrated his greatness by being wrong). As a result, one could claim together with Landsman that 'Amazingly, the one outcome of the Bohr-Einstein debate that is of lasting value for physics therefore concerns a phenomenon whose existence Einstein actually denied… and whose significance Bohr utterly failed to recognize!'[97]

The discussions between Einstein and Bohr focusing on the incompleteness of quantum mechanics 'were incredibly fruitful and informative for later developments in the foundations of quantum mechanics' and, 'with the exception of his controversial reply to EPR, Bohr's refutations of Einstein's arguments were extremely thoughtful and elegant'.[98] 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'.[99]

Independently of their disagreements, 'Bohr and Einstein were both quite worried about the problem of objectification in physics, especially in quantum mechanics… Bohr claimed objectification of a quantum system through the specification of an experimental context; Einstein claimed objectification of any physical system to arise from its (spatial) separation from the observer'.[100] Landsman shows mathematically that the positions of our two giants overlap significantly: 'a point

[96] See Stuart Freedman and John Clauser, 'Experimental Test of Local Hidden-Variable Theories', *Physical Review Letters* 28 (1972): 938–41; Alain Aspect, Philippe Grangier, and Gérard Roger, 'Experimental Realization of Einstein-Podolsky-Rosen-Bohm Gedankenexperiment: A New Violation of Bell's Inequalities', *Physical Review Letters* 49 (1982): 91–94; Alain Aspect, Jean Dalibard, and Gérard Roger, 'Experimental Test of Bell's Inequalities Using Time-Varying Analyzers', *Physical Review Letters* 49 (1982): 1804–7; W. Tittel, J. Brendel, H. Zbinden, and N. Gisin, 'Violations of Bell Inequalities More Than 10km Apart', *Physical Review Letters* 81 (1998): 3565–66. For a broader list of similar experiments, the reader could visit: https://en.wikipedia.org/wiki/Bell_test_experiments.

[97] Landsman, 'When champions meet', 217–218.

[98] Ibid., 216.

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

[100] Landsman, 'When champions meet', 216.

both failed to recognize, probably not merely for the ideological reason stated above, but undoubtedly also because of the desire of both to defeat the opponent'.[101]

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 sharply to distinguish between the autonomous behaviour of a physical object and its inevitable interaction with other bodies serving as measuring instruments.[102]

> 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 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.[103]
>
> …
>
> 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 unambiguous language with suitable application of the terminology of classical physics.[104]

[101] Ibid., 218.

[102] 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.

[103] 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.

[104] 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.

It appears therefore that we can speak of a type of contextual realism where, for Bohr, the epistemological problem was how experimental knowledge of quantum objects is possible through specifically designed experiments.[105] Bohr's focus on the necessity of classical concepts could be characterized 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 could help in understanding the positions of Einstein and Bohr

Landsman's article is particularly relevant for our discussion. The author is a well-known theoretical physicist[106] who, interestingly, employed a theological argument to enlighten the essence of 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 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'.[107]

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

[105] 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.

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

[107] 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.

thought is well known and documented), who spoke about the 'complacency of ignorance' in reference to the scholastic philosophers who defended the unknowability of God.[108] 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'.[109] 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',[110] and Bohr's reply to him that he 'should stop telling God what to do'.[111]

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.[112] 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.

[108] A. Donagan, 'Spinoza's theology', in D. Garrett, ed., *The Cambridge Companion to Spinoza* (Cambridge: Cambridge University Press, 1995), 343–82, 347.

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

[110] See note 82.

[111] 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?"'

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

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'.[113]

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.[114] 'Philonic 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'.[115]

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 offering a deeper understanding of the conceptual development 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

The describe the current situation of quantum mechanics I will use the testimony of David Mermin – a physicist who has made some genuine contributions to the

[113] 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, 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.

[114] 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'.

[115] Tikhon Alexander Pino, 'An essence–energy distinction in Philo as the basis for the language of deification', *The Journal of Theological Studies*, NS, 68.2 (2017): 551–71.

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 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.[116]

According to Mermin, a recent interpretation of quantum mechanics, called QBism, is "by far the most interesting game in town."[117] 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 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.[118] They maintain that, if probability is understood in this way, the notorious quantum paradoxes either disappear or assume less problematic forms.

[116] 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.

[117] 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.

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

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 her 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 beliefs about it in a future experiment or observation. State assignments, like probabilities, are relative to a specific agent. We could say therefore that QBism offers a fundamentally personalist perspective on quantum mechanics. Mermin summarizes the ingredients of QBism as follows.[119]

Focus on personal experience

QBism recognizes that individual personal experience is at the foundation of the story each of us tells about the world. The traditional Copenhagen (or so-called "orthodox", a term that, obviously, has nothing to do with theology) interpretation of quantum mechanics overlooks this central role of private personal experience because of its "deep desire to objectify and make impersonal what is, at the most fundamental level, unavoidably subjective and personal. To eliminate the confusion, it is necessary to acknowledge that science in general, and quantum mechanics in particular, is a tool that each of us uses to organize and make sense of our own private experience."[120] At the most fundamental level 'experience' does not mean a unique body of common human experience; it is private to the person having that experience. The same applies to the picture of the world that each of us constructs from our own private experience. There is a common external world in addition to the many distinct individual personal external worlds. The common world must be understood as the mutual construction that all of us have put together from our distinct private experiences, using our most powerful communication tool – human language.

Language

Personal experience is private, but language enables each one of us to communicate it to others. 'Language' is any way someone else can induce experiences in me, in a way that I can get some sense of the content of her or his personal experiences. My experience of others provides me with highly plausible evidence that they do indeed have experiences of their own, which play for them the same role that my experience plays for me. Language enables us each to hypothesize features that are common to our otherwise private personal experiences. This is how we can each arrive at something like a common understanding of major parts of the worlds that each of us has built from their own experience. We are in the habit of calling 'the world' this

[119] Here I am summarizing the ideas of Mermin in: N David Mermin, 'Making better sense of quantum mechanics', 2-5.

[120] Ibid., 2.

common understanding we all arrive at through language. Quantum mechanics is just a tool that we use to help us make sense of our personal worlds.

Actions

The world acts on every individual person, inducing the private experiences out of which he or she builds an understanding of the world. Reciprocally, individual persons act on the world and can infer the consequences of their actions on the world from the experiences the world creates back in them through its response to their personal actions. An action on the world can be gentle and implicit or as intrusive and explicit as, for example, using or reading about a complex apparatus that performs and records what happens in a carefully designed experiment.

> The outcome of an action, being an experience, is subjective. It is private to the person taking that action. But its representation in language can be communicated to other people. What I call the objective world is built out of such linguistically shared subjective experiences. Language is the only means we have for trying to compare the personal outcomes of all such users, and for trying to convey all those outcomes to users who were not watching or otherwise experiencing those actions and their consequences.[121]

Bettability – articulating the anticipation of things to happen

My prior experiences provide a basis for me to form expectations for the responses of the world to my potential actions. Those expectations can be expressed in terms of probabilities, i.e. as the odds at which I am willing to place or accept bets.

> Laws of science are the regularities we have discerned in our individual experiences, and agreed on as a result of our communications with each other. Science, in general, and quantum mechanics, in particular, impose further constraints on my probabilistic expectations. They help each of us place better bets on our subsequent experience, based on our earlier experience. We are able to navigate the world better because it is bettable. This is obvious for the laws of quantum mechanics, which are explicitly probabilistic. It also holds for classical physics, though bettability can be obscured in classical physics by a widespread misunderstanding of probabilities that are often very close to zero or one.[122]

For Mermin science can be viewed as a user's guide to the world and scientific laws are simply guides to action, which have proved to be spectacularly successful. Thus, the laws of science find their meaning in the actions they inspire in every user of science.

[121] Ibid., p. 4.
[122] Ibid.

Probability one – being confident about a potential outcome

According to Mermin, with the advent of quantum mechanics, deterministic mechanisms disappeared from physics. QBism holds that probability assignments are personal judgments even when p = 1, i.e. when we are absolutely certain about the specific outcome of an event resulting from our actions. Probability 1 indicates a particular intensity of belief: a supreme confidence in the positive outcome of a future event. It does not imply the existence of a deterministic mechanism guaranteeing the positive outcome. The fact that the assignment of probabilities of 1 or 0 are personal judgments is essential to the coherence of QBism.

> This view of probability 1 or 0 has the virtue of undermining the temptation to find any kind of 'nonlocality' in quantum mechanics. When a single photon is observed at one slit, nothing changes at the other slit when the probability of observing it there instantly drops to 0. The instantaneous change is in the expectations of whoever made the observation.[123]

Most physicists take it for granted that an outcome with probability 1 must be enforced by an objective mechanism. For a QBist, the assignments of a probability of 1 are also personal expressions of the willingness to place or accept bets.

Object and subject

For most physicists, science should be formulated in a way that makes no reference whatever to the personal experience of the individual user of science. Such conviction makes it impossible to articulate any of the above ingredients of QBism. According ot Mermin, it underlies almost a century of confusion about the meaning of quantum mechanics.

> The fact is that my science has a subject (me) as well as an object (my world). Your science has a subject (you) as well as an object (your world). Alice's science has a subject (she) as well as an object (her world). I make the same point three times to underline both the plurality of subjects, and the plurality of worlds that each of us constructs on the basis of our own individual experience. While each of us constructs a different world, the world of science is our joint construction of the vast body of phenomena that we try to infer, through language, to be common to our own individual worlds. Science arises out of our use of language to indicate to each other our individual experiences out of which we each construct our own individual worlds.[124]

[123] Ibid.,
[124] Ibid., 5.

QBism and the adoption of quantum mechanical perspectives in the human sciences

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."[125] This is because quantum theories 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 some fundamental bounds of the availability of this information. Recent developments in the use of quantum theories can be considered as an implicit confirmation of the relevance of such information-theoretic reading.

> 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 of their phenomenal reactions to being solicited, and of their informational dispositions. Such universal applicability of quantum theories to any domain whatsoever in which the replies to experimental solicitations depend on their order, 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.[126]

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

[126] Michel Bitbol, 'A Phenomenological Ontology for Physics,' in H. Wiltsche & P. Berghofer (eds.) *Phenomenological approaches to physics* (Heidelberg: Springer, 2020) hal-03039509, 3-4.

Christopher Fuchs – one of the most articulated proponents of QBism, suggested an ontology of participatory realism that was inspired by John Wheeler's post-Bohrian idea that quantum mechanics involves "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.[127] Thus 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.[128]

I can not think of a better hint pointing to the isomorphic relation between the roles of apophaticism in quantum mechanics and theology.

Conclusion

The present article adopted the Analogical Comparative Theological Approach (ACTA) to examine the encounter of Orthodox theology with physics. It offers a comparative exploration of the issues that emerged in the debates between St

[127] 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".

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

Gregory Palamas and Barlaam the Calabrian (fourteenth century), and between Albert Einstein and Niels Bohr (twentieth century). The comparative analysis follows the logic of the ACTA approach which requires a 'third position', a controversial issue or a conceptual challenge that could be used as an exploratory lens that would allow a productive engagement with these two domains of human experience and knowledge.

We can start the conclusion by making a methodological point. It should be admitted that the application of the ACTA approach depends on the content of narratives of the two debates in the way they were presented here. The shaping of the content of the narratives includes a certain degree of subjectivity that could result in missing some relevant points. Such subjectivity could be considered as part of the "softness" of the ACTA method and should be seen in a positive way since it leaves space for creativity and insightful reflection. For example, the two narratives presented here clearly emphasize the relevance, the intensity, and the impact of the two debates in both theology and physics. This is completely inline with the logic of the ACTA approach. There is however another related point that deserves to be mentioned. The two debates have a very interesting temporal overlap. Quantum theory was discovered in the 1920s and has been passionately debated since then. This is the exact time when the theology of St Gregory Palamas began to be rediscovered in the lively debates between Russian Orthodox emigre and Catholic theologians in Paris.[129] Since then the debates have acquired a more moderate and constructive format but there are still reverberating issues across the different denominations and within Orthodox theology itself. In both cases – theology and quantum physics – the emerging positions were articulated and refined in a controversial environment through a process of ongoing personal self-identification in the context of a particular tradition associated with, sometimes, an intentional contra-positioning (encounter) and even radicalization. In this sense, we can seek an analogy in terms of the similitude of the dialogical struggles that took place almost at the same time and in a similar polemical context.

Another issue emerging from the analogical analysis refers to the ways of using logic in both theology and quantum physics. In the case of Orthodox theology this issue was naturally associated with the discussion of what is actually knowable and provable about God, as well as with the distinction between Divine essence (unknowable) and energies (knowable). What is knowable about God should be considered from a participatory perspective. The ground for participation is that part of the essence that is open to created beings. In this sense, causality in theological syllogisms pertains to the things around God – the reality of the Divine energies. The distinction between the uncreated, incommunicable divine essence and the uncreated but communicable divine energies allows for an active relationship

[129] See the first chapters in Stoyan Tanev, *Energy in Orthodox Theology and Physics*.

between the uncreated God and the created world. The ultimate expression of this personal relationship is the experience of God as light which is made possible by the transformation of the natural human capacities through the enabling power of the gifts of the Holy Spirit. The union with Christ can be lived only in the Holy Spirit, and that the experience of being in the Holy Spirit is nothing other than union with Christ.[130]

In quantum physics the discussion of the need for a quantum correction of classical logic has emerged in a different context related to the complementarity of the manifestation of wave and particle properties of quantum objects. For Bohr, the aim of the idea of complementarity was to allow the application of the usual logical forms while providing the extension that was necessary for dealing with the new situation related to the problems of observation.[131] The key moment in the new situation was the realization that one could not speak anymore of objectively existing properties of quantum objects independently of observer's experimental intervention. It provided quantum physics experiments with a personal aspect by associating the objectivity of the reality of the quantum objects with the specificity of the participatory role of the observer in the design of the experimental setup. The key epistemological question for Bohr was how experimental knowledge of quantum objects was possible through specifically designed experiments.[132] We can see again how the challenges of applying the traditional logic were associated with what is experientially knowable about the quantum object by forcing the phenomenal manifestation of some of its natural energies. Most interestingly, we have seen how a contemporary theoretical physicist such as N. Landsman can apply a theological argument referring to the distinction between Divine essence and energies to explain the supposedly fundamental difference between the scientific worldviews of Bohr and Einstein.[133]

The most amazing similitude between the theological and quantum physics domains seems to be related to the ways apophaticism plays a role in them. This issue touches on some of their deepest epistemological aspects. A closer look at the controversial issues shows a common need of going beyond the challenges of representation, assertion and negation to the epistemological conditions of knowledge emerging through 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 participation. It allows to talk about an apophatic realism which

[130] Dumitru Staniloae, 'Trinitarian Relations and the Life of the Church', 14.

[131] Ibid., 115–16.

[132] 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.

[133] Landsman, 'When champions meet', 218.

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"[134] 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'.[135] 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 trough 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 sensitivity of quantum physicists was fundamentally enhanced by the current QBist interpretation which brings its participatory realistic perspective very close the characteristics of the apophatic realism that was described above.

The last point that will be made here refers to the concept of probability. Obviously, it is a technical term that emerges from within the context of 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 just think about it. Our prayers emerge from the depths of our personal existential situations. 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 wanted. 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 based on our personal experience and existential context. God respects our freedom and can satisfy all of our requests but He does also have a plan for us that may not result in what we have actually wanted

[134] R. Healey, *The Quantum Revolution in Philosophy* (Oxford: Oxford University Press, 2017), 3.
[135] Catherine Chevalley, 'Niels Bohr's Words and the Atlantis of Kantianism', 33.

in a particular moment of time. This is a point that would definitely benefit from a more comprehensive elaboration and will be addressed 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 (a term suggested by Fr John Breck as a better alternative to 'analogy')[136] between Orthodox theology and quantum physics.

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

Logic of Mystery: Reading Wittgenstein in parallel to Orthodox theology and quantum theory

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Theology and philosophy are predominately found within an analytical context, that is, a context within which a 'rigorous' system of thought is built from one element to another element. In parallel fashion, the same can be said regarding classical physics and its mechanical casual movement from one point to another point. Yet there are voices stepping out of these systems and moving towards a more 'living' thought. The move toward the 'living' can be found in post-classical physics with the inclusion of the observer, but long before this shift in physics there is the long standing Orthodox theology, and in between there are well known yet often misunderstood philosophers, such as Ludwig Wittgenstein. These 'living' voices want to draw us away from inert abstract systems back to ourselves and thereby back to humanity.

Introduction

Why is there a seemingly insatiable desire for templates behind our lives to secure knowledge, the ultimate physical building blocks of reality, causality, and perhaps even determinism? This yearning consumes much of Western philosophy, theology, and science; and frequently Aristotelian logic drives this mode of thought. There is no question regarding the general value of such logic, but to what extent can it be questioned? Archbishop Lazar Puhalo certainly does bring questions when he states: 'The Platonism and quasi-Gnosticism of Augustine of Hippo distorted theology in the West into a system of philosophical speculation, and forever separated it from the existential, living theology of Orthodox Christianity'.[1] Likewise, as noted by Léon Rosenfield in conversation with the Japanese physicist Hideki Yukawa: 'I asked Yukawa whether the Japanese physicists had the same difficulty as their Western colleagues in assimilating the idea of complementarity … He answered "No, Bohr's argumentation has always appeared quite evident to us;… you see, we in Japan have not been corrupted by Aristotle"'.[2]

Certainly, in our daily lives it can be very useful to check a barometer and a thermometer. We see the air pressure and temperature falling, dark clouds forming in the sky, and decide that there is a good reason to bring one's jacket and umbrella

[1] Archbishop Lazar Puhalo, *The Evidence of Things Not Seen: Orthodoxy and Modern Physics* (BC, Canada: Synaxis Press#, 2013), 16.

[2] Léon Rosenfeld, 'Niels Bohr's Contribution to Epistemology', *Physics Today* 16 (1963): 47.

for the day. We are obviously familiar with causality and it is useful. Indeed, we trust the independent and encompassing nature of causality to such an extent that we trust weather reports and do not feel the need to determine our own measurements to confirm a weather forecast. Yet how far can we go? How far can we go behind and beyond a particular person and weather? Is there a more basic and fundamental structure from which we can guarantee meaning in our lives—in contrast to our ordinary lives—whether a metaphysical principle or a reduction to the smallest parts? Of course, most are happy with the weather as it is explained. However, there must be something more meaningful to reality than our lives as we see them—something measurable beyond us or, so to speak, below us. Yet the move to seek meaning and foundations outside our lives and experience can lead to misguided abstractions. Perhaps we think that although an umbrella and the weather have no need of turning to abstractions, theology must deal in abstractions. However, as Puhalo notes, 'Orthodoxy is consistently critical of all forms of reductionism, all efforts by human beings to reduce the mystery of life to some comforting abstraction'.[3]

Obviously, classical physics has been and continues to be extraordinarily useful within a casual mode of thought, as is the person who reasons that an umbrella is in order, but confusion begins and grows as this mode of thought extends further and further beyond our ordinary daily lives. For example, when physics became more mathematically abstract and particularly when dealing with quantum theory, few seemed to notice that the empirical nature of everyday measurements, such as mass and velocity, were extending beyond its reach. That is, the empirical was boldly carried into mathematical formulations to carry the empirical into hypothetical entities beyond our ordinary lives as beacons of light. The desire to do so is aptly noted by Paul Holmer: 'intelligent people confront the uncertainties of life with all kinds of talents. Some of them complicate matters by seeing the uncertainties as temporary gaps in an otherwise seamless robe of complete truth, and one is intimidated by the gallantry of the vision'.[4] The posited beacons of light may seem like a guide for progression, but they are a misconception.

Moreover, many miss the relation between Western theology and the fundamental conceptions of Classical physics. Indeed, as Paul Davies says:

> The orthodox concept of laws of physics derives directly from theology. It is remarkable that this view has remained largely unchallenged after 300 years of secular science. Indeed, the theological model of the laws of physics is so ingrained in scientific thinking that it is taken for granted. The hidden

[3] Puhalo, 41.

[4] Paul Holmer, *On Kierkegaard and the Truth*, Foreword by Stanley Hauerwas (Cambridge: James Clarke & Co, 2012), 165.

> assumptions behind the concept of physical laws, and their theological provenance, are simply ignored by almost all… [5]

Clearly, more contemporarily many scientists have jettisoned God, but the theological concepts of immutability, unchanging nature, impassibility, etc., have remained in the physical laws.

In both cases, science and theology, one can easily find a desire for certainty and security, a foundation that, in some sense, is in opposition to mystery. This point must not be misunderstood. It is not being claimed that there is no point in investigation; rather, it is being said that the assumption that with enough time and resources our investigations will discover the answer to most, if not all, mysteries is wrongheaded. In other words, I am not referring to mystery as an epistemological mystery that will be solved someday given enough resources; instead I am pointing out mystery in and of itself. As such, Andrew Louth rightly notes that 'these are not just mysteries to contemplate, still less to solve; they are mysteries that draw us into communion with God'.[6]

In contrast to Western philosophy, theology, and Classical physics, Wittgenstein, Orthodox theology, and quantum theory (e.g., Bohr and the Copenhagen interpretation) are more comfortable with mystery and do not have the similar drive to explain and justify knowledge. Obviously, these three points of view—Wittgenstein, Orthodox theology, and Bohr—are distinct from one another, yet they all converge on the importance of our lives (participation) in contrast to excessive ratiocination.

For example, Andrew Louth notes:

> Had Jesus presented himself as a philosopher, then we would naturally have looked to him for teaching on the nature of God and his relationship to the world, the nature of divine providence and so on. Had Jesus presented himself primarily as a moral teacher, then we would not be surprised if his notion of God turned on how God is a source of moral values, moral commandments and so on. And in the tradition of western philosophy, going right back to Plato, we can see the way God has been invoked as the first cause, the ultimate explanation of everything, or as One who underwrites our moral values, either by issuing divine commandments for us to observe, or as himself the 'Form of the Good', or as the One who as Creator understands in a fundamental way human nature, so that from that understanding there can be derived a set of moral values, or a natural law.[7]

[5] Paul Davies, 'Universe from Bit', in *Information and the Nature of Reality: From Physics to Metaphysics*, eds Paul Davies and Niels Henrick Gregersen (Cambridge: Cambridge University Press, 2010), 71.

[6] Andrew Louth, *Introducing Eastern Orthodox Theology* (Illinois: Intervarsity Press, 2013), 20.

[7] Louth, 17.

And, as Puhalo notes, this can 'became no more than a system of religious philosophy and a school of ethics … strangled by the dry, lifelessness of philosophical theology and the moralistic religious fascism that it produced with its speculation in ethics, collapsed into … spiritual delusion … yet emancipated by St Antony (Khrapovitsky) of Kiev'.[8] Can we say, as it were, that science saw *this* God of the theologians and were therefore right to jettison such a God and instead turn to the above mentioned godless natural laws?

Wittgenstein and Orthodox theology

To provide an idea of the discord between reductionism and abstraction, on the one hand, and Orthodox theology and science on the other, it is useful to begin with an example in philosophy. In particular, Ludwig Wittgenstein provides an interesting example since his thought shows a change from seeking an independent logical structure for language to connect to in order to secure meaning to the logic and meaning found within our language use—our form of life. That there is a shift in his work after his 'early' work (*Tractatus*) is clear. He says, 'It suddenly seemed to me that I should publish those old thoughts and the new ones together: that the latter could be seen in the right light only by contrast with and against the background of my old way of thinking'.[9] Once again, he moves from placing logic under language to seeing logic revealed and shown in our common use of language. In the *Tractatus*, he thinks of language as tied to an independent reality; he thereby thought that logical form gives meaning to signs in our language, not agreement, as connected to the logical structure of the world. Thus, language equals using a sign logically, and the consequent meaning is a result of a link between the world and the corresponding signs of language which is set in a pre-established harmony. If the correspondence between the sign and the world link, then there is meaning.

Regarding this sort of conception, Puhalo notes:

> …the Scholastic process conceived that there had to be a one-to-one correspondence between every point of codified doctrine and spiritual reality, and this led to a form of idolatry. So also, in Aristotelian science, every theory was thought to have a one-to-one correspondence in physical reality. It was supposed, therefore, in both antique physics and Scholastic theology, that reality could be rationally determined, codified, linguistically defined and visualized in a constant form.[10]

[8] Puhalo, 18.

[9] Ludwig Wittgenstein, *Philosophical Investigations*, trans. G.E.M. Anscombe (Oxford: Basil Blackwell, 1983), iii.

[10] Puhalo, 68.

Moreover, 'Truth, then, is reduced to a rational system, deduced by logic … rather than on the living encounters of human experience in the realm of faith'.[11]

In contrast to his 'old' thoughts, Wittgenstein's 'new' thoughts do not emphasize epistemology or what we can and cannot say based on an underlying logical syntax. Instead they emphasize what we do say. In his later work, *Philosophical Investigations,* he shows the shift from his former atomistic conception of meaning; in particular, he rejects the idea that a proposition is whatever can be true or false. That is, what is true or false determines what is or is not a proposition. Wittgenstein was unsatisfied with the idea that philosophers can work out the logical possibility and impossibility of what can be said. Similarly, Bohr notes, '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'.[12]

To posit an underlying pre-established harmony or some type of conception of 'how Nature is' Wittgenstein's 'early' thought rejected metaphysics, such as 'how Nature is', and his later work also rejects metaphysics—but now *including* the underlying logical syntax. Abstractions and reductionism are rejected. Indeed, he becomes dissatisfied with the idea of any theory to explain language:

> Formerly, I myself spoke of a 'complete analysis', and I used to believe that philosophy had to give a definite dissection of propositions so as to set out clearly all their connections and remove all possibility of misunderstanding. I spoke as if there were a calculus in which such a dissection would be possible… At the root of all this there was a false and idealized picture of the use of language.[13]

He discards the idea that there is primary data upon which all else depends, such as Bertrand Russell's 'ultimate furniture of the world.' In a similar manner, as Puhalo says:

> Aristotelian Realism became the basis of religious philosophy. Where Platonic thought sought to transcend physical reality (and desire) in pursuit of a more abstract, spiritualized ideal, Aristotle espoused rationalistic logic… every teaching and dogma of the faith would be ascertained rationally through logic, and defined in minute detail… For the holy fathers, on the other hand, theology is always paradoxical.[14]

[11] Puhalo, 26.

[12] Niels Bohr, in A. Petersen, 'The Philosophy of Niels Bohr', in *Niels Bohr: A Centenary Volume*, eds A.P. French and P.I Kennedy (Cambridge: Harvard University Press, 1985), 299.

[13] Wittgenstein, *Philosophical Grammar*, ed. Rush Rhees, trans. Anthony Kenny (Oxford: Basil Blackwell, 1974), 211.

[14] Puhalo, 24.

Certainly, there are limits to knowing, but often we wrongly assume that it is the meaning that remains unclear, then we consider the possibility of thinking better, harder, longer, and with a language free of uncertainty, then we might succeed in knowing all. Regarding such thoughts, Wittgenstein notes:

> …a remarkable and characteristic phenomenon in philosophical investigation: the difficulty—I might say—is not that of finding the solution but rather of recognizing as the solution something that looks as if it were only preliminary to it... This is connected, I believe, with our wrongly expecting an explanation, whereas the solution of the difficulty is a description, if we give it the right place in our considerations. If we dwell upon it, and do not try to get beyond it. The difficultly here is: to stop.[15]

However, when he speaks of stopping philosophy, it is not philosophy in and of itself that he is stopping; rather, he is using philosophy to stop what he regards to be misguided philosophy.

The common opinion is that philosophy discovers the truth that is 'out there', a form of realism that seeks some form of reality beyond human forms of life; and these ideas are so entrenched in our thinking that one may assume that the only alternative is non-realism, subjectivism, and relativism. However, we do not need to fall into the flip side of these ideas. That is, realism and non-realism are the same coin, just the flip side of one another—both function with the idea of discovering a secure and knowable foundation—one says it is possible and the other says it is impossible. Perhaps both answers are wrongheaded, and instead of considering the possibility of a secure foundation outside our lives, or lack thereof, we should look at our lives.

Wittgenstein clears his thinking from the remnants of realism found in the *Tractatus*, where language and logic are independent of human life and people are, as it were, left out of the equation. Language is removed from the participant, and that it is not my or your language, but language itself with its own logical form—making it transcendental. In contrast, Wittgenstein's 'new' thoughts turn to the shown and revealed nature of logic and the language that we use in our everyday lives. The ideas that we are removed from the world as solitary observers and that ultimately there is a primary foundation outside our secondary everyday experience is rejected. Likewise, Kierkegaard rightly says, 'modern philosophy has tried anything and everything in the effort to help the individual to transcend himself objectively, which is a wholly impossible feat; existence exercises its restraining influence'.[16]

[15] Wittgenstein, *Zettel*, eds G.E.M. Anscombe and G. H. von Wright, trans. G.E.M. Anscombe (Oxford: Basil Blackwell, 1967), §314.

[16] Soren Kierkegaard, *Concluding Unscientific Postscript*, trans. David F. Swenson and Walter Lowrie (Princeton: Princeton University Press, 1941), 176.

What Wittgenstein also rejects, consequently, is scepticism. For the sceptic, the mind is a passive recipient of uncertain data that we cannot absolutely link with the external world. The sceptic sees the rather fleeting sense-data link between the external world and the mind and asks the obvious question: namely, 'how can I ever know or accurately describe reality with certainty?' Wittgenstein stops this scepticism in its tracks, not by winning the fight against it by positing further theories to provide a better explanation of how we can have knowledge, but by denying that the sceptics are even making any particular case.

Knowledge and certainty are found within our lives and do not rely on external strictures (e.g., simple object, innate ideas, perceptual qualities). Language and the world do not link by means of independent elementary propositions, which are either true or false. Rather, propositions are internally related and logic is based in language use; it is not that which underlies language. In contrast to Western thought, exactness is not dependent on metaphysical foundations, or a transcendental underlying structure, instead it is found in our everyday lives and conversations that show what is ruled out of our everyday language. If we focus on external foundations to gain exactness, we actually trade exactness for abstract theories.

Wittgenstein notes:

> In reflecting on language and meaning we can easily get into a position where we think that in philosophy we are not talking of words and sentences in a quite common-or-garden sense, but in a sublimated and abstract sense. As if a particular proposition wasn't really the thing that some person utters, but an ideal entity… But is the chess knight that the rules of chess deal with such an ideal and abstract entity too? (We are not justified in having any more scruples about our language than the chess player has about chess, namely none.)[17]

Likewise, Menas Kafatos notes that 'the dualistic conception of reality as consisting of abstract disembodied ideas existing in a domain separate from and superior to that of the sensible objects and movements became the most characteristic feature of Western philosophical and religious thought.'[18] Additionally, 'Khomyakov—according to description of Berdyaev—maintained that both rationalism and empiricism abstractly dissect the living consciousness and conceal from us that experience, in which is immediately given real being, the existent'.[19]

[17] Wittgenstein, *Philosophical Grammar*, 121.

[18] Menas Kafatos, *The Conscious Universe: Part and Whole in Modern Physical Theory* (NY: Springer--Verlag, 1990), 102).

[19] Rojeck, Pawel., & Oboevitch, Teresa, *Faith and Reason in Russian Thought* (Copernicus Centre Press, 2015), 13.

It is the context, the system of language, the existent, not abstracted ideals that are the basis of meaning. Yet some will then say, 'if there is no foundation, then it must mean that everything is arbitrary and reality is in question'. However, Wittgenstein notes: 'the rules of grammar are arbitrary in the same sense as the choice of a unit of measurement. But that means no more than that the choice is independent of the length of the objects to be measured and that the choice of one unit is not "true" and another "false" in the way that a statement of length is true of false.'[20] Moreover, he notes, '"So are you saying that human agreement decides what is true and what is false?" —It is what human beings say that is true and false; and they agree in the language they use. That is not agreement in opinions but in the form of life.'[21] He is emphasizing that the standard for correct or incorrect measuring is not an external measure, such as Platonic Forms or truths. There is no one measure of language that determines language. Instead, there is the entire system of language before us. He shows how the realist is in error when attempting to justify a particular proposition since the realist misses the entire context. In contrast to any one independent foundation that language rests on, he says, 'one might almost say that these foundation-walls are carried by the whole house'.[22]

Yet if Wittgenstein emphasizes everyday living and not a predetermined, independent, and external foundation, then does it follow that he is an idealist? The answer is no. Linguistic idealism denies that there is anything independent of language; instead, what we regard as reality is dependent on our language; that is, reality is shown in our language. It should be clear that this is the inverse of the *Tractatus*, where language mirrors the logical structure of the world. Linguistic idealism appears to leave language in a random position, with no anchor—which is exactly what the realist fears.

It is clearly problematic to regard reality as a product of minds and language. Did 'things' exist before humans and their ideas and language were able to create reality? Note, however, that if reality is dependent on language, then the idealist may resort to a timeless foundation, such as the Berkeleyan God, in order to avoid the criticism that there could obviously not be a reality prior to human beings creating it. By positing a God, it is then possible to make sense of prehistoric objects that are independent of human language and creation, but are internal to, and dependent upon, God's language. However, this is just disguised realism. Idealism in this form, like realism itself, posits an external and metaphysical foundation to which language necessarily conforms.

In any case, Wittgenstein is neither a realist nor an idealist. He does not argue in any way for the idea that language use creates reality. Clearly, reality is larger, so to

[20] Wittgenstein, *Philosophical Grammar*, 185.

[21] Wittgenstein, *Philosophical Investigations*, trans. G.E.M. Anscombe (Oxford: Basil Blackwell, 1958), 241.

[22] Wittgenstein, *On Certainty*, §248.

speak, than humanity. The close relationship between language and life, in contrast to the realist, is the nexus of the meaning. It is not an object of logical analysis or passive experience of data, nor is it a mental process of ideas; rather, the meaning is the use of the word as applied in everyday life. As Wittgenstein himself notes, we 'could not apply any rules to a private transition from what is seen to words. Here the rules really would hang in the air; for the institution of their use is lacking'.[23] We are placed in a physical world where our traditions and customs play a role in the development of language, while at the same time, our understanding of history, tradition, and custom is mediated by language. Language and life are complementary. Language mediates our contact with a reality that is not reduced to language; however, that reality so mediated is not independent of language. For Wittgenstein, logic was formerly outside language, but later he sees that logic is in language and shown through language. He shifts the discussion from one of distance and separation—that we and logic are independently related to the world—and the attached theories that try to mend what has been torn apart, to a discussion that shows how we, language, and logic, are in the world.

Likewise, in terms of theology, Ivan Kireyevsky aptly notes:

> The Slavophiles maintained that the West had lost the legacy of the Fathers and that is why in the West, theology became a matter of rationalistic abstraction, whereas in the Orthodox world it retained its inner wholeness of spirit. In the West, the forces of reason were split asunder, whilst here there was a striving to maintain a living totality. There the mind sought to find the truth by establishing a logical sequence of concepts, whilst here people aspired to it by elevating their self-consciousness to the wholeness of heart and the concentration of spirit. There we see a search for a superficial, dead unity, whilst here we find a striving towards inner, living unity.[24]

Mathematics and reality

We are not passive recipients (against realism), nor do we impose whatever we like on data (against idealism). These ideas can similarly apply to mathematics. Namely, the realist idea that numbers mirror reality, and the formalist view that numbers are only marks we fool around with; instead, it is in application that numbers become mathematics.

For example, is a number or formula a mathematical object? This is what happened in the case of physics as it became ever more complex and moved away

[23] Wittgenstein, *Philosophical Investigations*, §380.

[24] Ivan Kireyevski, *On the Nature of European Culture and on Its Relationship to Russian Culture*. Letter to Count E.E. Komarovsky , http://www.oocities .org/trvalentine/ortho - dox/kireyevsky_culture. html, May 2019.

from apples towards the abstract, and the idea of the physical causality of objects slipped into mathematical entities. Davies sees this and notes:

> …quantum mechanics demolished the concept of an external state of reality in which all meaningful physical variables could be assigned well-defined values at all times [in contrast to Newton and others]. So a subtle shift occurred…in which the ground of reality first becomes transferred to the laws of physics themselves, and then to their mathematical surrogates, such as lagrangians, Hilbert spaces, etc. The logical conclusion of going down this path is to treat the physical universe as if it is mathematics.[25]

This is exactly what Max Tegmark does with his Mathematical Universe Hypothesis wherein mathematical entities exist.[26]

In such a mathematical universe, Alexei Nesteruk's comment is apt:

> Fr Sergei Bulgakov,…builds his attitude to science on the basis of a criticism of its fragmented description of reality and limited capacity of comprehending the world as living nature. The mathematical universe expels living subjects by converting it into the kingdom of shadows and 'subjectless' objects: 'the ideal of natural science (…) would be to overcome this theoretical murder of nature that permits the study only of nature's corpse.'[27]

Although Wittgenstein is also obviously not commenting on Tegmark in particular, he aptly notes:

> …the comparison with alchemy suggests itself. We might speak of a kind of alchemy in mathematics. It is the earmark of this mathematical alchemy that mathematical propositions are regarded as statements about mathematical objects,—and so mathematics as the exploration of these objects. In a certain sense it is not possible to appeal to the meaning of the signs in mathematics, just because it is only mathematics that gives them their meaning. [28]

To assume that numbers exist somewhere beyond us to determine our calculations, or that logic or simple objects underlie mathematics and language to determine what we can and cannot say, and how we calculate, is upside-down. Or more properly,

[25] Paul Davies and John Gribbin, *Matter and Myth: Dramatic Discoveries That Challenge Our Understanding of Physical Reality* (New York: Simon & Schuster Paperbacks, 2007), 18.

[26] Max Tegmark, *Our Mathematical Universe: My Quest for the Ultimate Nature of Reality* (New York: Knopf, 2014), 255.

[27] Oboevitch, Teresa, *Faith and Reason in Russian Thought*, 45.

[28] Ludwig Wittgenstein, *Remarks on the Foundations of Mathematics*, 142e.

not even upside-down since not only are these structures a confusion, the logic in language and mathematics is internal to their respective propositions.

Certainly, descriptive propositions about the world can be true or false, but Wittgenstein argues that the logical syntax of mathematics is often wrongly construed as true or false. In other words, mathematical syntax does not form a description of the world, it is not part of epistemology. Mathematics does not arise from numbers, mathematics gives numbers meaning, and language does not arise from logic, it is in language that we understand logic and it by calculating that we understand numbers. An example of the problem of epistemology can be seen in the simple case of 1 + 1 = 2, and a 'law of nature' such as Einstein's famous equation E = mc2. Does the former contain pens or pencils, or the latter mass? We do not say, I am going to investigate '8'.

Moreover, the confusion of conflating mathematics with epistemology can be seen in the well-known Zeno's paradox of the tortoise racing the hare. If we say that points are empirical, then the result is that the hare must move half way from one point toward the next point, but to get there the hare must cross half the distance first, then the previous half, and so on *ad infinitum*. Once again, this problem is the consequence of treating mathematical propositions as empirical. It is a Platonist confusion to think that all the points together of a curve means the curve exists; instead, the curve is the rule. When mathematicians think that an expansion is surveyable they fall into Wittgenstein's criticism; namely, 'There is no religious denomination in which the misuse of metaphysical expressions has been responsible for so much sin as it has in mathematics'.[29]

What about a mathematical proof? Perhaps we assume that there is a truth in the proof. However, consider the distinction between a mathematical proof and the proposition, 'There are two dogs in my office'. A proof does not prove anything that exists prior to the proof. There were already two dogs in my office before the proposition was formed and the subsequent empirical investigation. Yet in the case of the proof there is not something *a priori* behind the proof, instead it is the proof itself that proves the rules of logical syntax in the proposition. The proof and the mathematical proposition are internal to each other—unlike the contingency of the proposition regarding how many dogs are in my office.

What Wittgenstein does in language and mathematics is reject an external independent foundation of logic and metaphysical objects, of course this leads many, given the prevalence of realism, to assume that he is providing a skeptical account of mathematics and turning it into a will-o-the-wisp. The problematic idea is that either mathematicians discover mathematical truths that were existent 'out there' to be discovered, or mathematicians concoct mathematics, which then is not certain and is open to revision and construction. Mathematical knowledge, once divested of

[29] Wittgenstein, *Culture and Value*, 1.

epistemological considerations and an independent foundation may seem suspect, but Wittgenstein wants to show the certainty mathematics has: its rules.

In other words, unlike empirical propositions, mathematical propositions as rules of syntax, need to be grammatically understood—but this is not empirically verified. The propositions in language and mathematics are similar in that both must have an application—that is why they are both called propositions—but the proof and the mathematical proposition are internally related. Yet there is the constant search for an external and independent reality to justify our propositions. For example, Euclidean geometry was 'demoted' since it no longer held an *a priori* status, and it was seen for what it is, namely, an autonomous axiomatic system that has its own rules of logic and uniformity. Yet why would this confirm devaluation? The reason is that it did not offer the 'true' connection to reality. The problem realist mathematicians get into is that they focus on a complete realist system, and Euclidean geometry no longer fits. What they miss is that Euclidean geometry is just one form of propositions within a system of propositions.

As Wittgenstein sees regarding language, there can be various language-games, and since there is no *one* language, it then follows that one does not displace another. His philosophy of language, in terms of logic, then applies to the logic of math in a corresponding manner. Both language and mathematics have propositions that are in a relation within their own system; however, since the nature of each is different, that is, the former are descriptions of the world while the latter are not, it follows that they are verified differently. The former are verified by checking the world while the latter are verified by means of their logical syntax. In other words, there is no isomorphism for language or mathematics—as if real numbers mirror those transcending us. Meaning is not some entity that somehow connects to a name or number, rather the meaning follows from its application. Words cannot say their meaning; the meaning is shown, and it is shown in human life and activities.

As previously noted, Wittgenstein abandons referential meaning, for example, that the meaning of a name is the object it links to, or a formal principle, and instead sees that a word only has meaning within a system of propositions and the rules within each system. Consequently, in terms of mathematics, Wittgenstein remarks:

> What does mathematics need a foundation for? It no more needs one, I believe, than propositions about physical objects—or about sense impressions, need an analysis. What mathematical propositions do stand in need of is clarification of their grammar, just as do those other propositions. The mathematical problems of what is called foundations are no more the foundation of mathematics for us than the painted rock is the support of a painted tower.[30]

[30] Wittgenstein, *Remarks on the Foundations of Mathematics*, 171e.

It then follows that 'it is essential to mathematics that its signs are also employed in civil life. It is the use outside mathematics, and so the meaning of the signs, that makes the sign-game into mathematics'.[31] Hence, mathematics is not based on abstract forms, objects, formalism, logical atomism, or the like; rather, it takes form as applied within our form of life. Likewise, as Louth notes:

> The Orthodox taste, the Orthodox temper, is felt but it is not subject to arithmetical calculation. Orthodoxy is shown, not proved. That is why there is only one way to understand Orthodoxy: through direct orthodox experience… to become Orthodox, it is necessary to immerse oneself all at once in the very element of Orthodoxy, to begin living in an Orthodox way. There is no other way.[32]

Yet Wittgenstein sees the questions being asked:

> But doesn't it follow with logical necessity that you get two when you add one to one, and three when you add one to two? And isn't this inexorability the same as that of logical inference?' –Yes! It is the same. –'But isn't there a truth corresponding to logical inference? Isn't it true that this follows from that?' –The proposition: 'It is true that that this follows from that' means simply: this follows from that.[33]

He uses the following analogy to show this point: 'How should we get into conflict with truth, if our footrules were made of very soft rubber instead of wood and steel? –"Well, we shouldn't get to know the correct measurement of the table." –You mean: we should not get, or could not be sure of getting, that measurement which we had with our ridged rulers'.[34] The search for a justification for a mathematical proposition is a consequence of bringing in epistemology, while Wittgenstein sees that a mathematical proposition, unlike an empirical proposition that is contingently true or false as compared to the world, is not something we justify; rather, we have agreed that it is a rule.

Wittgenstein rejects the idea that numbers inhabit an external reality (realism) and he also rejects the idea that numbers are nothing more than marks on paper (formalism); instead, through use and application numbers become mathematics. Likewise, rather than a name standing in for a simple object as was the case in the *Tractatus* (logical atomism), he later showed how words have meaning within a system of propositions, and logic is not underlying this system as a supporter of

[31] Ibid., IV, 2.
[32] Louth, 15.
[33] Wittgenstein, *Remarks on the Foundations of Mathematics*, 4e.
[34] Ibid., 4e.

regulation and meaning; instead, logic is shown in the propositional system. In other words, the key here is not an independent external reality, but the logical syntax of what we say and how we do mathematics: their use.

Quantum physics and reality

This confusion of confounding the epistemological with logical syntax and the empirical is perhaps even more difficult to work out in physics, since there must be an empirical verification. However, as physics became much more theoretical it became more difficult to separate the empirical experiments with mathematical constructions of reality. Indeed, as noted by Paul Davies, 'scientists often use the word "discovery" to refer to some purely theoretical advance. Thus one often hears it said that Stephen Hawking "discovered" that black holes are not black, but emit radiation. This statement refers solely to a mathematical investigation. Nobody has yet seen a black hole, much less detected any heat radiation from one'.[35] The notion of universal and transcendent mathematical relations, a universal concept, an independent reality we discover, conflates the empirical abstract calculations.

Yet within physics there is still a strand supporting the idea that since there are various results in experiments and differing possibilities (quantum theory), it is still necessary to find a determined and independent mathematical system—the idea that reality is more wondrous than our own humble and rough roads. Yet the observant still noticed the fog in these theories and the incredible difficulty of charting a proper course of causality from one to the other. So, in order to progress, they posited hidden variables, that is, beacons of light hidden by the fog that nonetheless connect the causal points. This then created a rather odd chart (in other words, that they were unknown was proof of their hiddenness) and the uncertainty of it all became too exasperating for many—where is the shore? Some answered that, in the end, there is no particular foundational shore to reach. I think this is the correct point. However, their particular answer is not an answer. They say that there is no particular shore to reach because there is an infinite number of shores. The multiverse. If there is an infinite number of shores, then all possibilities are accounted for at once. In a sense, this amounts to no possibility. Whichever way this is perceived, it is thought that we can then be out of the fog and back on the clear solid causality and determinism. Even though no one has ever seen or lived in this foggy charted area—it is only a thought.

The problem of extending into metaphysical reality is noted by Bohr in the following:

[35] Paul Davies and John Gribbin, *Matter Myth: Dramatic Discoveries That Challenge Our Understanding of Physical Reality* (New York: Simon and Schuster Paperbacks, 2007), 18.

> …it must be realized that the very definition of mathematical symbols and operations rests on a simple logical use of common language. Indeed, mathematics is not to be regarded as a special branch of knowledge based on the accumulation of experience, but rather as a refinement of general language, supplementing it with appropriate tools to represent relations for which ordinary verbal communication is imprecise or too cumbersome. Strictly speaking, the mathematical formalism of quantum mechanics and electrodynamics merely offers rules of calculation for the deduction of expectations about observations under well-defined experimental conditions specified by classical physics concepts.[36]

Likewise, in theology Puhalo aptly notes that many 'failed to realize that dogma and doctrine, are only the algorithm for theology, and the artificing and refining of the algorithm became, for them, the very meaning of theology itself'.[37]

For example, Wittgenstein read Hertz and said:

> Hertz addresses the problem of how to understand the mysterious concept of force as it is used in Newtonian physics. Hertz proposes that, instead of giving a direct answer to the question: 'What is force?' the problem would be dealt with by restating Newtonian physics without using 'force' as a basic concept. When these painful contradictions are removed' he writes, 'the questions as to the nature of force will not have been answered, but our minds, no longer vexed, will cease to ask illegitimate questions.[38]

In contrast, for example, to conventional logic, what is pursued is the participatory nature of reality. This can be seen in Bohr's principle of complementarity, he states: 'the old question of an ultimate determinacy of natural phenomena has lost its conceptual basis'.[39] In contrast to determinacy, a basic point of complementarity is the simultaneous and contradictory nature of a particle and wave. Aristotelian logic cannot demarcate this contradictory nature other than showing that it is a paradox. To be tied to Aristotelian logic may not be surprising; there are, of course, many differing points of view. However, it is very surprising that it has become so unquestioned, perhaps even a universal assumption in Western theology and science.

In any case, it is clear that physics may not be best understood fundamentally as Aristotelian, nor can it eliminate the observer in favour of an independent mechanical clock reality. As Wolfgang Pauli notes:

[36] Bohr, *Collected Works*, Vol. 10, 406.
[37] Puhalo, 17.
[38] Ray Monk, *Ludwig Wittgenstein: The Duty of Genius* (London: Jonathan Cape, 1990), 25.
[39] Bohr, 'On the Notions of Causality and Complementarity'. 54.

> To me it seems quite adequate to call the conceptual description of nature in classical physics… the ideal of the detached observer. In drastic words the spectator must, according to this ideal, appear in a fully discrete manner as a hidden spectator. He can never appear as an actor. Nature is hereby left alone in its predetermined course of events, without regard to the manner in which the phenomena are observed.[40]

Additionally, Zeilinger comments:

> In physics we cannot talk about reality independent of what can be said about reality. Likewise, it does not make sense to reduce the task of physics to just making subjective statements, because any statements about the physical world must ultimately be subject to experiment. Therefore, while in a classical worldview, reality is a primary concept prior to and independent of observation with all its properties, in the emerging view of quantum mechanics the notions of reality and of information are on an equal footing. One implies the other and neither one is sufficient to obtain a complete understanding of the world. [41]

It is obvious, yet important to point out that information is not a type of Platonic Form, instead it is what we can experience through our everyday lives. From a theological point of view, Puhalo remarks, 'reality does not consist in abstract, disembodied ideas, but in that which we experience'.[42] There is meaning in, for example, the experience and life of liturgy, without logical analysis of justifying the connection of the parts of the liturgy with a metaphysical reality. Rather, the divine reality is shown in the liturgy. This is the most common mistake on behalf of the realist, to assume that since a metaphysically argued reality is rejected, then one rejects the reality of God. Clearly not. Instead, God's reality is not understood as a metaphysical reality but is a living reality. The problem is not reality in and of itself, it is the metaphysical realism that is so commonly accepted.

Interestingly, Bohr notes: 'Epistemological sophistries cannot possibly help him attain these ends (dealing with life, death, existence …). Here, too, the relationship between critical thought about the spiritual content of a given religion and action based on the deliberate acceptance of that content is complementary'.[43] It is not proofs that are the answer to such issues. The point here is that a metaphysical speculation is a rather disinterested investigation and certainly cannot heal issues

[40] Anton Zeilinger, 'Vastakohtien todellisus', in *Festschrift for K.V. Laurik Ainen*, eds U. Ketvel et al. (Helsinki University Press, 1996), 174.

[41] Zelinger, 'A Foundational Principle for Quantum Mechanics', 642.

[42] Puhalo, 73.

[43] Niels Bohr, in, Heisenberg, *Physics and Beyond*, 90.

of life and death. We live in a participatory world—Wittgenstein clearly saw this. Yet this is a difficult task because this dissolution of secure independent foundations brings us into the fray, and we are a messy business. It is much easier to live in abstract thought—a castle in the sky. Indeed, as Wittgenstein says, 'the very things which are most obvious may become the hardest of all to understand. What has to be overcome is a difficulty having to do with the will, rather than the intellect'.[44] In other words, generally speaking, the oddity of Western philosophy and theology lies in the assumption that philosophy and theology provide proofs for the erudite while the unschooled only believe.

Conclusion

Andrew Louth refers to Fr Pavel Florensky as 'one of the greatest Russian thinkers and theologians of the last century'. According Florensky,

> …the life of the Church is assimilated and known only through life – not in the abstract, not in a rational way. If one must nevertheless apply concepts to the life of the Church, the most appropriate concepts would be not juridical and archaeological ones but biological and aesthetic ones. What is ecclesiality? It is a new life, life in the Spirit. What is the criterion of the rightness of this life? Beauty, yes, there is a special beauty of the spirit, and, ungraspable by logical formulas, it is at the thinking and doing, being and praying same time the only true path to the definition of what is orthodox and what is not orthodox. The connoisseurs of this beauty are the spiritual elders, the startsy, the masters of the 'art of arts', as the holy fathers call asceticism. The startsy were adept at assessing the quality of spiritual life.[45]

Thus, experiments in physics and, for example, the startsy in Orthodoxy do not allow any sense of subjectivism. As Wittgenstein has said, it does not make sense to speak of a private language. We are necessarily grounded in a history and tradition.

Rather than the intellect solving epistemological mysteries, we are indeed led back to mystery itself. In contrast, to such metaphysical speculation, Louth states, 'I began by asking: where do we start? and reflected on the paradox that we seem to start from a place of unknowing, not in the sense of ignorance—as if we started off with little knowledge and found that it increased—but in a more fundamental sense—starting off with an awareness that the One we seek to know is beyond any capacity we might have for knowing'.[46] Moreover, 'These lead us to the other

[44] Wittgenstein, *Culture and Value*, ed. G.H. von Wright in collaboration with Heikki Nyman, trans. Peter Winch (Chicago, IL.: University of Chicago Press, 1984), 17.

[45] Louth, 14

[46] Louth, 4.

element involved, for prayer to Christ and openness to his voice takes us back to the point we started with—the mystery of God. For that mystery is not simply an intellectual mystery; it is something much deeper'.[47] Similarly, as Bohr notes, 'In quantum mechanics we are not dealing with an arbitrary renunciation of a more detailed analysis of atomic phenomena, but with a recognition that such an analysis is in principle excluded'.[48]

Accepting mystery and paradox is no longer so easily categorized as lazy or crazy. It is clear that physics has become aware of this and Orthodox theology continues this awareness. Moreover, it is more than obvious that neither Bohr nor Wittgenstein were opposed to scientific investigation, nor by any stretch were they Christian apologists. Yet they both showed the confusion of conflating or reducing reality and meaning to metaphysical or logical confines.

Again, this must not be misunderstood. The point is not that there is something that we simply cannot understand and therefore just accept the fact that we cannot understand it, but maybe someday someone will understand it. Instead, mystery is a given and in a theological context it is additionally a personal relationship. For example, mystery manifest in the liturgy, and this relation to mystery is not a cognitive metaphysical mystery. Another way of putting this is that since the mystery is in the liturgy, it is not the case that the liturgy points to an abstract metaphysical mystery outside the liturgy—it is concretely lived.

In the end, humanity is not a collection of objective entities who merely seek an increasing number of objective truths, but is the passionate subject who may, for example, participate in scientific measurements or participate in the liturgy. However, in the latter case, it is not only participating; it is becoming.

[47] Louth, 7.
[48] Niels Bohr, *Essays 1932–1957 on Atomic Physics and Human Knowledge*, Vol. II, 62.

Psychoanalysis And Eschatology

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After the arrival of psychoanalysis, nothing has remained untouched by it, and this is even more the case if we add Freud's meta-psychological ambitions, which sought to explain even more broadly the phenomena present in the individual soul, such as culture, religion, art, etc. Theology in particular felt directly threatened by Freud's militant atheism. Despite this fact, however, I would still hazard saying that at the deeper level of ontological presuppositions and consequences, psychoanalysis has yet to receive proper theological treatment or be given sufficient interpretation.

Theological Hermeneutics and Depth Psychology[1]

A century after the publication of the first edition of *The Interpretation of Dreams* (1900), it would merely be to repeat a truism to claim today that not only the method of investigation of psychoanalysis but also its terminology have come to permeate the whole of Western humanistic thought, a unique phenomenon in the intellectual history of the modern period. Despite initial objections, the new Freudian 'science' has proved to have established itself not only in the realm of experts but in the common perception of modern man about himself. The popularisation of psychoanalysis has already produced a veritable mythology about the soul, and it is not at all rare to hear terms taken from the first and second Freudian local description of the psyche thrown around in public as common sense and self-evident.

At the same time, much water has flown since then in the river once carved out by Freud. Many of his views have been reconsidered, and 'depth psychology' is now carried along countless new hermeneutical channels and 'schools', none of which can lay claim to very great success in their attempts to develop the 'science of the unconscious'. Of course, there has been no lack of attempts to 'return to Freud' and his 'holy' texts, usually of varying levels of inspiration and accompanied by radical hermeneutical revisions, either at the level of theory or of clinical practice, which is only natural given that the latter constitutes the goal of the former.

[1] A paper given at the International Conference 'Orthodox Theology and Psychotherapy' in Aliartos, Greece on 1–5 October 2003. Published in Greek, as part of my book *Psychoanalysis and Orthodox Theology: on Desire, Catholicity, and Eschatology*, (Αθήνα: Αρμός, 2003). Translated in English by Vincent DeWeese.

In the decades that have passed, theology and philosophy have shared the same ambivalence toward this new modern 'science'. Scholars in both disciplines have instinctually perceived that psychology was laying claim to domains that at one time or another belonged to their own authority—indeed, after the arrival of psychoanalysis, nothing has remained untouched by it, and this is even more the case if we add Freud's meta-psychological ambitions, which sought to explain even more broadly the phenomena present in the individual soul, such as culture, religion, art, etc. Theology in particular felt directly threatened by Freud's militant atheism, and from that time, beginning with the trials undergone by pastor Oscar Pfister at the hands of his superiors, clergy and theologians dealing with psychoanalysis have had to face not only their own personal internal conflicts, but also external doubts and persecution, which have continued until this very day. Despite this fact, however, I would still hazard saying that at the deeper level of ontological presuppositions and consequences, psychoanalysis has yet to receive proper theological treatment or be given sufficient interpretation—I mean with the sobriety that comes after either the enthusiasm of the newly converted to psychoanalysis or the horror of the fundamentalist before it has already passed.

Personally, for today's discussion I chose a philosophical path toward what is ultimately a theological hermeneutical encounter. I chose such a path because philosophical criticism is for many naturally more credible than theological criticism, which cannot but be perceived as fundamentally reactionary and consequently unreliable. A theological conversation, however, can take place afterwards on the basis of this philosophical critique; moreover, by first approaching the topic philosophically, we also help those who do not otherwise have the appropriate theological training or studies to follow this conversation.

Toward this end, I have selected three of the most important philosophical critics of psychoanalysis in the twentieth century: L. Wittgenstein, P. Ricoeur, and C. Castoriadis, because I consider their critiques to be complementary and ultimately most susceptible to theological hermeneutical engagement. To begin with, Wittgenstein represents perhaps the deepest philosophical criticism of psychoanalysis in the twentieth century, and one which has not received the attention it deserves, and thus the specialist literature on the subject has remained scant. To this day, the most important book published on the topic is perhaps that of Jacques Bouveresse, which in its English translation carries the very telling subtitle, *The Myth of the Unconscious*.[2] Wittgenstein's first critical objection has to do with the scientific character of psychoanalysis itself: the philosopher refuses to concede

[2] See J. Bouveresse, *Philosophie, mythologie et pseudo-science. Wittgenstein lecteur de Freud* (Paris: Editions de l'éclat, 1981). English translation by C. Cosman, *Wittgenstein reads Freud. The Myth of the Unconscious* (Princeton, NJ: Princeton Univ. Press, 1995). See also Assoun, P.L., *Freud et Wittgenstein* (Paris: PUF, 1988). Cioffi, F., 'Wittgenstein's Freud', in *Studies in the Philosophy of Wittgenstein*, ed. Winch. McGuiness, B., 'Freud and Wittgenstein', in *Wittgenstein and His Times*, ed. McGuiness (Oxford: Blackwell, 1981).

even this much to Freud. That which psychanalysis has to offer is not *scientia* but *speculatio*—'something prior even to the formulation of a [scientific] hypothesis' (*Lectures and Conversations*, 44).[3] Freud's immense self-confidence, dogmatism, and faith in the existence of a single, unique explanation—namely, his own—leads him to constantly make generalisations based on one-dimensional personal interpretations: this is the definition, according to Wittgenstein, not of science, but of *mythology*[4]—a mythology intended to astonish and impress the bourgeois class of his time. Consequently, Freud cannot grasp within the violence of his interpretation either ethics, religion, or art in what Wittgenstein calls 'their transcendence'.[5] Moreover, in mythological fashion, the unconscious, though it constitutes the essence of the psyche, can in reality only be approached by means of the conscious mind.[6] As if fabricating a mythology, then, the unconscious 'is made into a being', as if it were a 'someone' who acts, thinks, desires, works, plays practical jokes, dreams, and makes verbal slips without the self being aware of it, but all while *completely conscious*, as an independent and autonomous entity.[7] Moreover, in a way that resembles aesthetics more than science, the interpretation of the life and constitution of this 'being' is carried out not objectively but through the *persuasion* of the analyst and the *consent* of the analysand.[8] In the same way, the unconscious mind is personified as a *homunculus*, to which 'personal' properties can be attributed, such as judgment, control, censorship, desire and other such qualities,[9] not to mention a remarkable facility with language. If, however, Wittgenstein continues, the unconscious truly speaks, then it follows the rules and codes of logic and language, and, consequently, it is not really 'unconscious' at all[10]—here a citation of Lacan would not be out of place.

Freud can be said to be acting as a philosopher, Wittgenstein claims, since he deems it sufficient to study a single case of hysteria and, from there, to abstract the entire structure of the human psyche.[11] Likewise, he deems it sufficient to base his hermeneutic scheme for dream interpretation on his insistence that dreams essentially constitute a form of disguised wish fulfilment. Generalising and universalising as a philosopher would, from a very small number of individual cases, and then adding the mythical prestige of the analyst, he offers a liberatingly arbitrary and dogmatically one-sided explanatory framework for interpreting dreams with the same eagerness that an archaeologist might interpret his findings. For Wittgenstein, conversely, the interpretation of dreams is instead that which is necessary here and now for me to find the inspiration to creatively construct a teleology of my

[3] Cited from the English edition of Wittgenstein's works edited by Bennett, Oxford.
[4] J. Bouveresse, *Wittgenstein reads Freud*…, *ibid*., 12–13.
[5] *Ibid*., 17.
[6] *Ibid*., 25.
[7] *Ibid*., 34–35.
[8] *Ibid*., 26–27.
[9] *Ibid*., 38–39.
[10] *Ibid*., 40.
[11] *Ibid.*, 45.

conscious activity.[12] Like in the case of free association, we are dealing with artistic material susceptible to varying interpretations—if dreams are a language as specific and translatable as Freud thinks, then, the philosopher claims, we should also be able to translate language into dreams.[13] In other words, the symbolism found in dreams must be approached with great caution and careful thought; Freud's positivism makes him try to compulsively seek out the supposedly true causes of behaviour at the very moment when the aim of therapy could not be absolute knowledge, but a deeper understanding of mental realities and the world. There cannot exist, Wittgenstein says, a positive science of motivations and mental causation, but only interpretation[14]—a multiplicity of possible interpretations—on the condition that we first suspend Freud's positivism and naturalism.

The problem of spoken 'unconscious' motives can be found precisely in this contradiction. In actual clinical practice, unconscious motives are discovered through personal explanation of causes; however, on another, meta-psychological level—which constitutes the core of psychoanalytic theory—these motives are considered to be emanations from a strictly constructed superstructure, which is rationally and even deterministically articulated and produces an almost metaphysically fixed causality. According to Wittgenstein, this is exactly Freud's worst prejudice or, better yet, a series of prejudices:[15] to begin with, his psychic determinism, as a metaphysical or mythological conviction that, supposedly, mental phenomena ought to be fully deterministic and explainable. Here Freud seems to be completely out of touch with the development of natural science in his own age, such as, for example, the theories of relativity and quantum indeterminacy. This first prejudice leads to the second, which consists in his faith that everything in mental life necessarily has a meaning, aim, or intention that can be understood through a few given principles, and then the third prejudice follows as a natural consequence: the conviction that an explanation that applies to a portion of the facts can explain the entire world of facts as a whole.

Wittgenstein accepts psychoanalysis as a form of persuasion and aesthetics, as hermeneutics and inspiration, as a contribution to the process of self-creation and self-awareness in a way that we would call *eschatological*, even though it is here without particular theological significance (in spite of its clear Biblical roots). In the same way, he can also accept the unconscious, as a fulfilment of the personal myth of the subject, while rejecting Freud's deterministic and positivistic 'science' and the deterministic psychic mechanism implied by it. I think that Wittgenstein would accept that Freud's great discovery was, as Erich Fromm puts it, the conflict between thought and existence, a conflict unacceptable and humiliating to 'modern' Western

[12] *Ibid*., 116.
[13] *Ibid*., 110.
[14] *Ibid*., 80.
[15] *Ibid*., 83–96.

man.[16] We owe to Fromm, too, a number of other insights, insofar as the integration of Freud's work into the Western intellectual tradition is concerned—something that we will return to later. Of course, Freud himself reduced the significance of his own discovery by believing that this conflict was fundamentally a clash between thought and childhood sexuality—since it was precisely sexuality that was repressed in his time and social class. The philosophically idiosyncratic founder of psychoanalysis would hardly have been unable to generalise on any other basis, believing that whatever happened in the Vienna of his time was valid for all time periods of human existence. Whatever the case may be, for Wittgenstein, the only prospects for psychoanalysis could be found as a theory of aesthetics or hermeneutics.

It is exactly on this point that we can now engage with the thought of our next philosophical guest, Ricoeur.[17] Our French philosopher seeks, by connecting Freud with Hegel, to situate psychoanalysis within a philosophical perspective in which the unconscious meets and irrigates the conscious mind. What is essential here is an 'intersubjective relativity', which is created during analysis. My unconscious is something that I possess for another; it is the conscious mind of the other that reveals through its interpretation the content of my own unconscious, in the process of our common search for meaning.[18] The unconscious is not an objective and independent 'being' or *homunculus*, Ricoeur says (implicitly perhaps following the thought of Wittgenstein), but is rather constituted precisely by this intersubjective act of interpretation and dialogue—the unconscious is an intersubjective reality, not a thinking 'being', but a web of hermeneutical intersubjective relationships. But this brings to the fore the extreme incompleteness of Freud's hermeneutic since new spheres must now enter into the 'construction' of the unconscious besides the sexual: for example, the sphere of the workspace and of the acquisition of goods, that of power and its aims and ambitions, that of values and their formulation in common with others.[19]

In this way, therefore, the unconscious comes into contact with the conscious mind. If the conscious mind is connected with creation and history and aims at the fullness and complete development of the person's powers within a personal eschatological perspective of human perfection, then the unconscious is the first principle, the source, the yet unrefined meaning and, in this way, an impersonal fate as simply the 'other' of the conscious mind. The intersubjective refining of this primitive meaning is absolutely indispensable so that the eschatological perfection of the conscious mind is not a naïve self-deception, but an authentic, meaning-giving event for the real, suffering, traumatised, and often existentially floundering human being, a real illumination of his mental darkness rather than a foolish and dreamlike

[16] In E. Fromm's work, *Greatness and Limitations of Freud's thought*, 1980. In the Greek translation, *Το Μεγαλείο και οι Περιορισμοί στη Σκέψη του Freud* (Athens, 1983), 39.

[17] We are using here the essay of P. Ricoeur, 'Consciousness and the Unconscious', in his book, *The Conflict of Interpretations* (Illinois: Northwestern Univ. Press, 1996).

[18] P. Ricoeur, *ibid*., 106–108.

[19] *Ibid*., 110–112.

narcissistic pseudo-ecstasy. Ricoeur comes very close to doing theology here. If the unconscious mind represents for the conscious mind an intersubjective process of creating authentic meaning and perfecting the fullness of that which man really is (as an icon of God, in theological language), then this process is identical with that which the Orthodox tradition has named—not, of course, ethics, but *ascesis*, or, if you wish, as I dared to call it recently, 'apophatic ethics'[20] (because this is what I think *asceticism* is). This is an ethics of the Other, a description of the infinite modes of freedom with which the human being encounters and assimilates the grace of the free and loving God, by introducing continuously and without end the miracle of the contingent particular person into his eschatological becoming, which constitutes his own particular and unrepeatable intersubjective 'essence'. If the unconscious mind is understood as intersubjective, ascetically accomplished meaning, which in the end becomes 'consciousness', then it ultimately serves as a guarantee of authentic eschatology, in the purely theological sense of the word.

We must, however, take yet another short break here from theology in order to return to philosophy as we promised at the beginning and, this time, to the philosophy of Castoriadis, so that we can finish our treatment of the issue at hand. By doing so, we hope to highlight the fundamental issues that only a philosopher who was also a psychoanalyst could raise regarding classical psychoanalysis. For Castoriadis, the deepest paradox or contradiction within Freudianism emerges from the way in which, on the one hand, Freud stresses the creative breadth of the psyche, expounding on the role of imagination and the possibility of self-recreation and, on the other hand, how he also tries to formulate a deterministic and rationalistic theory or science to explain the workings of that same psyche.[21] Psychoanalysis is an opportunity for self-transformation, not by thought alone, but by a poetic-practical activity, as the philosopher calls it,[22] a creation of the self by the self, as a new beginning for its history within a realm of potentialities[23]—not so much as a personal philosophy but as a form of meaning, of 'enmattered', vital reasons.[24] The past is transformed from fate into a kind of eschatological creation and an opening into the truth of communion,[25] into a liberation (of the Enlightenment kind).

I am not at all convinced that Castoriadis ever liberated anyone in this way, but I do find it interesting how this ultimately 'eschatological' understanding of psychoanalysis brings to the surface (paradoxically) its unconscious *biblical* roots…

[20] Fr N. Loudovikos, 'Η Αποφατική Ηθική και η Εκκλησιολογία του Ομοουσίου Κεφάλαια για την ηθική εξατομίκευση στην Ορθόδοξη Εκκλησία', in the volume *Σύναξις Ευχαριστίας, Χαριστήρια εις τιμήν του Γέροντος Αιμιλιανού* (Αθήνα: Ίνδικτος, 2003), 555–80.

[21] C. Castoriadis, Les Carrefours du Labyrinthe, Greek transl. Τα Σταυροδρόμια του Λαβυρίνθου (Αθήνα: Ύψιλον, 1991).

[22] C. Castoriadis, *ibid*., 45.

[23] *Ibid*., 69.

[24] *Ibid*., 63.

[25] *Ibid*., 100–101.

Indeed, important books have been written about Freud's 'Hebraism'.[26] Despite his formal rejection of the Jewish religion, it continued to exert an influence over him, even if just below the surface. The biblical roots of psychoanalysis, of course, did not affect its founder's naïve positivism and materialism, nor did it touch his patriarchal bourgeois mindset, which saw the other, and woman in particular, as an 'erotic object' outside of the self, an object to be possessed and in which, in bourgeois fashion, 'I invest' my libido and likewise divest from later on. Moreover, these biblical roots influenced quite a bit the ideal of *control* (the keyword here) over the instinctual urges by the now legendary psychic Ego through the Superego;[27] as can be seen, we are still dealing here with the Cartesian and Kantian transcendental punctual self, which is all-powerful and exercises control over the whole world. While the discovery of the unconscious shakes the very foundations of this imaginary, narcissistic omnipotence, Freud's intention was still *control* over the unconscious, to find the best possible fortification for the sovereignty of the Ego over the unconscious: 'there where the Id finds itself, the Ego must reach' according to his well-known formulation.

Despite all this, in a very theological manner, Freud's human being is thought to have an ultimate end, a purpose, a capacity for eschatological fullness, a paradise of meaning, a restoration from the ancestral sin, which is expressed very vividly in his concept of the 'death instinct' (*destrudo*), which usually is taken to be incomprehensible by those who study Freud without having a theological background.[28] Naturally, Freud presents God as the sadistic Father of the uprooted Hebrew in exile, and he shows an ambivalence toward him that is extremely tense, verging on murderous. At least in theory, however, there exists a happy ending to analysis, where the instincts re-find their meaning, and the unconscious—now subjugated—becomes a source of enrichment: Jerusalem is re-inhabited and the happiness of the city of God makes up for the pain of its long wandering in neurosis. As Rice shows us, Freud returns again symbolically to the Father, now reconciled with his world.

Strangely enough, psychoanalysis is, in its essence, a *sui genesis* eschatology construed along biblical lines, and this is why it cannot be a positive science but an interpretive art and aesthetic, as Wittgenstein, another Jewish genius, understood so well. Only in this way can it surpass the constraints of its founder's determinist positivism, materialism, and atheism. Psychoanalysis cannot offer any positive, independent knowledge about the soul, but it can help open the latter to meaning. It can help the human being in cooperation with another human being pose the question of his ultimate end, the question of the end times, and, in that redeeming light, to

[26] The most important of the recent books published on this topic is perhaps that of Emm. Rice, *Freud and Moses. The long journey Home* (NY: State Univ. of N.Y. Press, 1990).

[27] E. Fromm, *Greatness and Limitations*, 19–23.

[28] Fromm is himself an example of this unease in the face of Freud's 'death drive', which he too rejects precisely on account of it being rationally incomprehensible (*ibid*., 150).

reread his life. The countless 'schools' of depth psychology are all ways of speaking forth this meaning, which like the being in Aristotle 'is said in many ways' (*λέγεται πολλαχῶς*)[29] and mainly through the psychopathological symptom.

In what way then, someone could perhaps ask, is psychoanalysis different from philosophy? Does the fact that psychoanalysis is not a positive science deprive it completely of its scientific character? Equally fascinating is another question: in what way, then, does psychoanalysis differ from theology?

The answer that I would personally be inclined to give may seem provocative to many: psychoanalysis seems to be at its base a former philosophy that wishes to become a theology, and herein lies its fundamental 'scientific character'. I would define this scientific character precisely as the intuition or hypothesis, expressed in the empirical realism of analysis, that this mythical 'being' that is called the unconscious, which corresponds in the anthropological model of transcendental idealism to the 'mythical other' that is required next to the mythical detached conscious mind, can become a real experience of authenticity. I think that perhaps Lacan understood this better than Freud, and Jung perhaps better than anyone else. We cannot discuss this issue within the limits of our talk today, but I think that it is exactly this 'theological' nostalgia for empirical authenticity that provides psychoanalysis with the quality of empirical science, and I would add, similarly, the nostalgia for the fertile indeterminacy of the person, toward which any interpretation of the unconscious is always ultimately working. The unconscious, when understood within a truly intersubjective hermeneutic, becomes a condition for existential authenticity; it is transformed from a mythical 'being' into the given real, living material of active encounter. Here philosophical intersubjectivity can be transformed into a 'theological' ascesis of communion—something that, of course, greatly exceeds Freud's conscious intentions.

The whole difficulty with psychoanalysis resides in the fact that if one does not understand the theological roots of its scientific character, if one is not aware of this and, even more so, if one denies it outright, then psychoanalysis risks being left in ontological limbo and returning awkwardly to its philosophical past (positivistic, deterministic, and rationalistic). Because when we say that psychoanalysis can be scientific only insofar as it is 'theological', this means that it can operate *anti-metaphysically* and *anti-ideologically* only by surpassing philosophy, metaphysical theology, as well as pseudoscientific mythology, and by putting itself at the service of 'Being to come', the eschatological Being-in-becoming of the person.

Of course, I am now speaking about a consciously theological approach to psychoanalysis and its companion, depth psychology. As we say, there cannot exist a distinctively Christian physics or mathematics, even though a robust Christian worldview can provide a direction and a framework for scientific investigation[30]

[29] See Fr N. Loudovikos, 'Η Αποφατική Ηθική…', 557.

[30] See Fr N. Loudovikos, 'Οντολογικές και Κοσμολογικές Συναντήσεις Θεολογίας και Φυσικών

(although we do not often think of this). Psychoanalysis and psychotherapy, however, unlike physics, can both consciously approach theological experience simply by searching out their own empirical and anti-ideological or anti-metaphysical foundations—elements which of course, we should note, we also encounter in great part in the writing and experience of the Greek Fathers. If psychoanalysis and psychotherapy do not enter into dialogue with theology, it will be much more difficult for them, lacking a cultural or spiritual reference point, to justify their biblical eschatological roots—which Freud was the first to betray—and very strangely, they will lose the important guiding thread that could render the hermeneutics of psychoanalysis empirically realistic, albeit without conforming at all to positivistic conceptions of the 'scientific'.

The achievements of depth psychology will remain incomplete as long as it remains in its 'pre-theological' stage, and these achievements will receive new corroboration as soon as psychoanalysis begins to gradually enter into its 'theological' stage (which will require rejecting many elements of a purely Freudian anthropology). Here, Orthodox psychoanalysts can perhaps play an important role.

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Theology and the Discovery of the Unconscious: Preliminary Remarks

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The most recent relevant discussion seems to involve, perhaps unavoidably, a theological account of the Unconscious, which lies behind almost all concepts on the adoption of which concepts psychoanalysis depends. In the present paper I will limit myself to studying some important books that show the current status of relevant research, and then I will attempt to offer some more, though still preliminary, theological remarks.

In my book entitled *Psychoanalysis and Orthodox Theology: On Desire, Catholicity, and Eschatology,*[1] I ventured to search for the uncovering of a possible spiritual dimension of psychoanalysis that somehow 'correlates' with fundamental theological notions. For this purpose, I confined myself to what are in my view three of the most important and common concepts, considered bridges between theology and psychoanalysis: First, that of *Desire* as it is described in its subjective functioning according to Lacan, or, in theological terms, of *natural will* (as formulated by St Maximus the Confessor), which has to be rooted in nature as an expression of its internal life , instead of being just a vehicle of the intellect. In this way it can express human desire as the pure yearning for unity, both internal and external, which can hold all things together, an ontological unity that can be properly expressed by the theological notion of *consubstantiality.*[2]

Second, the concept of *Catholicity*, which I called 'Inter-Intra-co-Being', developed as a theological commentary on the psychoanalytic experience of inter-subjectivity, where the pan-unity of all things (co-being) takes place within the

[1] Αθήνα: Αρμός, 2003.

[2] Regarding the concept of consubstantiality, see in my book *Analogical identities: The Creation of the Christian Self. Beyond Spirituality and Mysticism in the Patristic Era,* (Turnhout: Brepols, 2019), 183: ' The achievement of the of nature is, of course, the work of Christ, who draws together the ontological gaps which segment the relationship of created things between themselves and God, effecting this thereafter in the Church through the mysteries, as "Eucharistic Ontology" of the entry from now of beings into the last things of the Kingdom. As regards the will, from the point of view of the believer, the manner in which this consubstantiality emerges, which Christ Himself activates eucharistically in the Holy Spirit, is a bond of the personal will towards others, as a relationship "bringing all, through the one logos of creation to the one cause of nature" (Maximus the Confessor, *To Thalassius,* PG 90, 724C-725A), i.e. to consubstantiality' .

subject, in his or her psychosomatic existence (intra), but it is constantly verified through the active presence of the real other (inter), who is given voice and existence in the subject, thus initiating a true '*dialogical reciprocity*'[3] in which the final mode of being is realized in a non-passive dialogue between God and man, taking the form of an *ecstatic* synergy out of mutual love between them.

Third, the concept of *Eschatology*, a Biblical concept par excellence, which, applied to psychoanalysis, manifests its anti-metaphysical orientation, expressed in its effort for a hermeneutical re-construction of the subject, a self-re-creating, which overcomes their present neurotic de-construction in a quest for a genuine, true, and full Self. Within such an *Eschatology,* the vision of an existential *Catholicity* is annexed together with the liberating experience of the restoration of the full human existential *Desire*. Psychoanalysis, on another level, together with philosophy and art, is part of this long-term 'building up' of Man—of the immanent *eschaton* in process.

All the above discussion unavoidably involves a theological account of the Unconscious, which lies behind all mentioned concepts on the adoption of which concepts psychoanalysis depends. In the present paper I will limit myself to studying some important books that show the current status of relevant research, and then I will attempt to offer some more, though still preliminary, theological remarks.

The first of these books is Matt Ffytche's *The Foundation of the Unconscious: Schelling, Freud, and the Birth of the Modern Psyche.*[4] Ffytche understands his work as a correction and further development of Odo Marquard's and Michel Foucault's works. In his highly original study entitled *Transcendental Idealism, Romantic Philosophy of Nature, Psychoanalysis* (1987, in German), Marquard finally argues that psychoanalysis is simply a modification of the methods of thinking originally adopted by transcendental philosophy and then transformed into a sort of a philosophy of nature: one could say that psychoanalysis is a disenchanted 'Naturphilosophie'; that is why it thinks in the manner of a 'Naturphilosophie'. To support this hypothesis, he provides a list of various conceptual features the two systems of thought hold in common, for instance, the turn from mind to 'nature', the emphasis on recollecting and clarifying the prehistory of the ego, as well as the project of consciously retrieving Unconscious histories. He suggests that their relationship has remained rather unnoticed largely for the reason that Schelling's writings are no longer widely read. Moreover, he thinks that, in this way, psychoanalysis follows transcendental philosophy's falling away from an engagement with political reason.

Michel Foucault, on the other hand, in his work *The Order of Things: an Archaeology of the Human Sciences*[5] argues that the Unconscious centres on the ways

[3] I have extensively analysed this term in my work entitled *A Eucharistic Ontology: Maximus the Confessor's Eschatological Ontology of Dialogical Reciprocity* (Brookline MA: Holy Cross Orthodox Press, 2010).

[4] Cambridge: Cambridge University Press, 2012.

[5] London: Tavistock, 1970 or 1980.

in which society, emerging self-consciously as itself the agent of representation, attempts to establish a hypothetical relationship to the deeper or foundational basis of its own practice, whether this basis was viewed in logical, historical, or evolutionary terms. At some points Foucault seems to use the Unconscious as a tool for criticizing the whole project of German idealism, putting forward a conception of subject as a self-constituted and absolutely free consciousness. At other points, his concern is with those aspects of human phenomena that escape the rationalizing drive for the self-consciousness of cogito. In yet other moments, Foucault alludes to the attempt to ground human existence through the intellectual recovery of distant historical origins. All these versions of the Unconscious are united in a single principle that forms a powerful undertow within his account of the twentieth century as a whole. For him, while 'representation' is the central issue for the nineteenth century, the Unconscious is the characteristic of the twentieth century. And, of course, psychoanalysis sets itself the task of making the Unconscious speak through consciousness.

Furthermore, there exists the 'liberal Unconscious'. For Ffytche, (now drawing on Eli Zaretsky's *Secrets of the Soul: a social and cultural history of Psychoanalysis*),[6] the Unconscious, since it forms the foundation for a new science of the individual mind, is not detachable from some nineteenth century attempts to give an account of autonomy, originality, and independence, concerning the individual. Thus, people endorse psychoanalysis to help recast the promise of individual autonomy, which encompasses the freedom to think one's thoughts and to decide for oneself what to do with one's life; in addition, autonomy is not restricted to the sphere of morality but applies as well to creativity, love, and happiness.

The core argument of Zaretsky's book is that the increasing interest in an Unconscious psyche reflects not merely the attempt to produce an adequate account of the phenomena of inner life but also a concern with establishing the possibility of a self-created self, or a self whose logic of development is irreducibly detached from more systematic forms of explanation or from the idea of its manipulation by external authorities or other determining causes. Finally, for Ffytche, the concept of Unconscious emerges, firstly, from these vital debates about freedom and autonomy; secondly, from the search for holism, in an effort to take roots in nature, and, thirdly, from the search for 'thinking independence, spontaneity, particularity, originality, and self-authorship against, or alongside the universal legislation of reason'.[7] All these, according to the author, bring Freud into close association with Schelling. What brings them together, however, is not a Romantic vision of the unity of nature. It is that Freud makes a detour through biological and evolutionary theory in order to fix the ultimate basis of human individuality. The turn to nature and the attempt to reconstruct a logic of separation and conjugation in life's most elementary units is everywhere shadowed by tensions in the modern and liberal theory of individuality

[6] New York: Alfred A. Knopf, 2004.
[7] Ffytche, 27– 8.

and by the anxieties of the contemporary world. However, let us keep this turn to nature in mind as an essential characteristic of the Freudian understanding of psychoanalysis (and, subsequently, of the Unconscious), also taking into account the theological connotations this concept of nature carries with it in Schelling's thought.

The second book is Suzanne Kirschner's *The Religious and Romantic Origins of Psychoanalysis: Individuation and Integration in Post-Freudian Theory.*[8] According to her,

> the contemporary Anglo-American psychoanalytic developmental theories are cast and elaborated in terms of a generative metaphor that has an ancient and culturally distinctive source: the Judeo-Christian mystical narrative of the history of the soul. This narrative pattern has been progressively secularized and interiorized: the entire trajectory now is seen to take place in this world, over the course of an 'ordinary' life. Moreover, it is now told as the story of the development of the individual personality—not of the history of race, or the world. In place of the Plotinian distaste for individuation [...] and individuality, as well as Christian mystics' ambivalence regarding them, psychoanalytic developmental psychology imbues individuation with an unambiguously positive value; it is made an end in itself. As for that other end of development, exemplified in the capacity for intimate relationship, it too has been modified over the course of time and disenchantment. The essentially rationalist and materialist view of the world in which psychoanalytic theory participates dictates that the forms of 'redemption' still permitted us by Psychoanalysis—intimacy, authenticity, the creative process, and, in a more subtle sense, internalization itself—are more modest, more truncated, certainly less enduring and absolute than the traditional religious forms.[9]

Thus, like its forbears, the psychoanalytic narrative remains a narrative of ultimate concern, spelling out the terms of the meaning of life and the sources of suffering.

In the rather positive Christian account of the value of individuality, one may add the Romantic movement, which turned theodicy into a 'biodicy'. As Kirschner claims, the Romantic narrative eschewed 'God' and the 'soul' and, in a complex transposition that has precedent in Boehme's system, substitutes 'mind' for both of these. The ultimate problems of existence were no longer conceived in terms of the soul's estrangement from God but rather in terms of man's estrangement from nature. Man is estranged, so the Romantic narrative goes, both from those 'natural' (uncivilized, instinctual) aspects of himself and, perhaps even more crucially and fundamentally,

[8] Cambridge: Cambridge University Press, 1996.
[9] S. Kirschner, *The Religious and Romantic Origins of Psychoanalysis*, 194.

from 'nature' as the entire world external to himself—the 'object[s]' from which the subject has been severed. Now,

> heaven and hell are in the human breast; this is the place where we find meaning and fulfillment in our lives [...] Thus was accomplished the completion of 'the transference of faith to the inner life [...] The 'ordinary-life' arena of the self and its relationships is the contemporary repository of once-theological concerns about the meaning of life and the nature and sources of fulfillment .[10]

Echoing the Biblical narrative, the *Fall* is no more considered separation from God, and, consequently, salvation does not mean reunion with him but exclusively a betterment of this finite life. Even the idea of progress, so important for the psychoanalytic intervention, is clearly an ex-Biblical idea. Ultimately, so Kirschner asserts:

> psychoanalytic psychology conceives of the human condition and the life-course as fraught with inevitable suffering, frustration, and loss, and furnishes a framework by which at least some of these vicissitudes are given a rationale and are endowed with meaning. A corollary implication is that it is essential to explicate these dimensions of human existence and to understand their role in determining individual and social activities. [11]

In this sense, psychoanalysis embodies another layer of cultural significance, acquired via the 'translation' of the mystical narrative into high Romanticism. This is so because some of the psychoanalytic features, such as the irrational, the affective, and the life and growth of the self, are characteristically Romantic preoccupations. Also Romantic, and perhaps even more fundamental, is the fact that psychoanalytic modes of explanation embody a distinctive way of conceiving of experience, as well as of the human condition and the potentials for its renovation. According to Kirshner, the Romantics insisted that the philosophies of the Enlightenment produced an inadequate, spiritually and morally impoverished means of making sense of the human condition. They looked backwards to Christian mysticism and translated it into secular terms. In this way, the Romantic movement can be fruitfully understood as having introduced into European educated culture a new vocabulary for designating certain domains and modes of experience, meaning, and values. Its critique of the Enlightenment and other modern European social and intellectual trends constituted an insertion of naturalistic, non-theological versions of worldly mystical Christian doctrines into Euro-American intellectual and cultural discourse.

[10] Op.cit., 196.
[11] S. Kirschner, *The Religious and Romantic Origins of Psychoanalysis*, 197.

In any case, Kirschner avers, whether or not specific psychoanalytic theorists considered themselves or could be interpreted as 'crypto-Romantics', these psychoanalytic modes of explanation clearly can be viewed as carriers of this counter-Enlightenment set of connotations. Romantic thinkers and artists perceived a shallowness and a spiritual impoverishment in much of emerging Modernity. In their view, disenchanted visions of nature, self, and history were inadequate (despite such visions' bright teleologies) to offer hope for a moral and existential integration that took full and sophisticated account of the inescapability of suffering and tragedy (an inescapability made all the more poignant and concrete by the Romantics' own experience of the French Revolution). Just as the Romantic spiral was conceived to provide a more efficient spiritual account, so psychoanalytic theories too embody a perpetuation of this tragic-hopeful sense in the midst of later-modern social life. Thus, finally, as Kirschner states, these theories can be seen as efforts to preserve (and as evidence too that such preservation is vital or absolutely required), through transmutation, an inherited spiritual dialectic of severance and integration, suffering and redemption.

I am not quite sure that the above is an adequate explanation of the birth of the Unconscious—since it is impossible not to see in all this development also the persistence of Enlightened rationalism, now transformed into a thirst for ultimate knowledge of the Unconscious, according to Freud's famous suggestion—but it seems nonetheless true that the emergence of the Unconscious is related with both a sense of degradation of human nature in Modernity and an aiming at restoring its integrity and truth. It is also clear enough that without the Christian cultural substratum, which more or less inspired the romantics, this fertile implicit criticism of the Enlightenment that brought about the psychoanalytic discussion of the Unconscious would perhaps not have taken place.

I have left last Michel Henry's emblematic *Généalogie de la Psychanalyse: Le Commençement Perdu,*[12]—a book that forms an invaluable source for the research of the recent Western history of the Unconscious. In this work, Henry understands the Unconscious as a by-product of Descartes' philosophy of consciousness and its final neglect of the concept and the reality of life under his final definition of the soul in his 'Second Meditation'. And it is, according to the author, Schopenhauer who stopped this reign of the metaphysics of representation inaugurated by Descartes 'by declaring that this metaphysics has nothing in it which could refer to the condition of the real being or the true existence'[13] and that being cannot become an object for anyone, including itself, because it must be identified with life. This 'interpretation of being as Life, is the crucial event of the modern culture, the moment when it turns towards its Beginning, and acquires the means to join it again'.[14] Now the 'fun-

[12] Paris: Presses Universitaires de France, 2003 (1985).
[13] M. Henry, *Généalogie de la Psychanalyse*, 8, my translation.
[14] Op.cit., my translation.

damental determinations' of existence come to the fore, such as body, action, and affectivity. Schopenhauer establishes human *primitive corporeity*.

On the other hand, Henry continues:

> the Kantian theory of the interior sense which reduces this, i.e. the absolute subjectivity, into an ec-stasis from time, and thus into a representation, prevents us from giving a phenomenological meaning to immanence, which immanence defines, at the end of the day, the will. The will is placed under the yoke of the Western thought, and it is submitted to its fate, which fate is that this thought is produced in the light of the temporal ec-stasis, and enters the darkness of representation, or the Unconscious. Life is thus lost at the very moment it is given a name, and Freud is already here.[15]

This approach of life reaches its peak of course with Nietzsche and his 'eternal return of the Same'—which is Life. Thus, according to Henry, the Nietzschean will is finally the Unconscious darkness of life that escapes the light of representation; the Unconscious is identified with life, which runs under the representative thought, forming being's secret foundation. In this way, and beyond representation, 'l' inconscient est le nom de la vie'[16]. There exists a reciprocal movement between consciousness and Unconsciousness, and this mutual possession forms an ontological law 'where all the future of being lies'. Thus, the Unconscious part of the representation forms the 'essence of life'.[17]

However, Henry seems unable to see that this new ecstatic will that now wants to express nature gets out of nature immediately again, since it soon becomes a will-to-power that always exceeds nature, understanding being as always 'more than being'. Therefore, it is not so much an affirmation of life as it is rather its final negation, precisely in favour of an unlimited transcendence for the sake of power itself. At any rate, what remains extremely important is Henry's identification of the Unconscious with life, something which of course can be directly attached to the long modern Western intellectual crusade to restore the integrity of human nature, even, at times, against Enlightenment, as this process is described by all the authors discussed above. What is extremely important—and Henry was not perhaps prepared to fully admit it—is that all this thinking about life is rooted in the Christian Theology of Incarnation and Resurrection and is practically inconceivable solely within the context, for example, of ancient Greek philosophy, where nature is not capable of holding within it divine life in its fullness.

After all the above considerations I may proceed to some preliminary remarks concerning my topic:

[15] M. Henry, *Généalogie de la Psychanalyse,* 9, my translation.
[16] Op.cit., 348.
[17] Op.cit., 349– 50.

1. The Unconscious seems to relate with the truth and the fullness of human nature/life. But it is impossible in our Greek-Western Christian world to conceive of this nature/ life *without its theological premises, especially those of freedom and autonomy, holism, catholicity, particularity, originality.* And of course, any sort of absolute affirmation of nature *per se* ends up with various sorts of naturalism. A theological proposal can perhaps be to think of this nature as *'a dialogical nature'*, meaning by this a state of constant dialogue between man and God, a dialogue of ontological significance, concerning the true *mode of existence* of things.[18] Here Orthodox Theology could provide crucial insights into the anthropological and 'spiritual' dimension of psychoanalysis, especially by the mediation of this *dialogical nature* drawn from Eastern Patristic theology. In addition, the exploration of the Unconscious could enrich Christian hermeneutics with conceptual tools for deepening this nature conceived as an *open nature,* as I have already called this elsewhere.[19] But this has to be proved.

2. The Unconscious obviously has to do with the desire/will, and this subsequently means, with *ecstasis*. We need a history of *ecstasis*, in both East and West, in order to discern similarities and differences concerning the possible meaning of the Unconscious. It is true of course that in the West, in general, *ecstasis* is usually conceived in an almost Neo-Platonic way. Does that mean that the Unconscious is *against ecstasis,* or is it an expression of it? However, as I have recently claimed, a sort of forerunner of to the modern notion of the Unconscious can be traced to Maximus the Confessor's formulations of the *natural will.*[20] What does this mean for a possible theological interpretation of the Unconscious?

3. The Unconscious is *apophatic*, as it happens with life itself; it is a radical unknowability, which, however, pretends to possess an absolute knowledge concerning the essence of human nature. (Bion's work is perhaps the best modern articulation of this). But how can we, theologically speaking, analys e this bipolarity of unknowability and knowledge? In order to do this, it is essential that we find a true *analogical* dimension in the Unconscious—a possible analogy between divine fullness and human inwardness. The questions *if* this could be possible and in *what sense* remain open. The Unconscious then has to be connected with what I have recently called the *analogical identity* of man.[21]

[18] In my *Eucharistic Ontology: Maximus the Confessor's Eschatological Ontology of Dialogical Reciprocity,* above.

[19] See my *Analogical Identities*, 312.

[20] Op. cit., 70.

[21] See my *Analogical Identities,* 264ff.

4. The Unconscious therefore is wise—not only through negating representation but also because it reflects primordial human nature and life, a sort of human *Ursein—a*nd thus it can be related with the image of God in man.
5. In this sense the Unconscious is revealing: it discloses hidden aspects of this image.
6. And precisely because of this, the Unconscious in both, I think, its theological and psychological interpretations is also *eschatological,* in the sense that it pertains, in both cases, to the final fulfillment of human nature.

All these remarks form working hypotheses and fields of research for their author, rather than proved positions. It is, I think, obvious that unless we further study the relation and the difference between not only modern anthropological philosophy and Christian theological anthropology, but also, and perhaps mainly, between ancient philosophical and Patristic concepts of life, nature, person, and *ecstasis*, it is impossible to explore the notion of the Unconscious in its fullness.

Ways of Comprehending

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This paper is the Prologue of the forthcoming book *Ways of Comprehending,* by A.S. Fokas (World Scientific, 2022): This book is dedicated to my three children and to all young people in the hope that it will offer them the happiness and personal fulfilment that follows from acquiring an understanding of the origin of their thoughts, feelings, and actions.

The search for understanding gives rise to deep admiration for the immense wisdom and beauty of Nature, and in particular for its greatest achievement: the human brain. Writing this book, I felt deep sense of gratitude for the privilege of being able to enjoy a plethora of complex and multifaceted creations of Nature and humanity. I hope, and expect, that those who read this volume will experience similar feelings.

'Unification' and 'analogical thinking' are central themes of this book. In this connection, it is worth noting that the completion of the formalism that unifies the four fundamental forces of nature, the gravitational, electromagnetic, weak, and strong interactions, still stands as the holy grail of physics. By analogy, it is natural to attempt to integrate the biological and cultural 'forces' dictating life. In this volume, an effort is made to explore this unification.

By analysing fundamental neuronal mechanisms, it will become clear that the human brain is predisposed to seek *knowledge* and *beauty*, without the artificial distinction between *sciences* and *humanities*. It is argued that such a grand quest requires an interdisciplinary, integrative approach. Furthermore, it is suggested that this search is facilitated by employing the notions of *cognition*, *computability*, *creativity*, and *culture*. The necessity for such a unified approach follows from the insight that *everything is related to everything else*. Perhaps no one expressed this fact better than Leonardo da Vinci, the embodiment of interdisciplinarity:

> 'Study the science of art. Study the art of science. Develop your senses—especially learn how to see. Realize that everything connects with everything else'.

A crucial part of an interdisciplinary approach to knowledge and culture is the appreciation that life generously provides many sources of pleasure and satisfaction, beyond the utilization, efficiency, power, and beauty of technological creations. Indeed, in life there also exists that which, according to Ludwig Wittgenstein, 'cannot

be said'. It is the part which is not only non-verbal, but more generally non-algorithmic. It is *spiritual*, where spirituality refers to accessibility of emotions and other creations of the unconscious. It is the *transcendental* part that lives in the exceedingly rich and mysterious world of the unconscious. I believe that life is incomplete without this part of insight, beauty and potential eudemonia.

A Paradox and its Resolution

Our times are characterized by an apparent paradox: on the one hand, there exists a vast amount of information and resources, and therefore the potential for broad knowledge, understanding, and personal fulfilment. On the other hand, there is a strong tendency for specialization and limited appreciation of the enormously rich scientific and cultural achievements of humanity. Moreover, the continuous bombardment of the brain with discrete, disconnected pieces of information brings confusion and a sense of alienation. The feeling of living in a world that becomes more and more difficult to comprehend. If we do not understand the world we live in, how can we define the meaning and the value of our actions?

The above paradox brings to mind Erwin Schrödinger's passionate appeal to fulfil the human 'longing for unified, all-embracing knowledge'. This statement, made in his highly influential 1944 book *What is Life*,[1] was followed by the Nobel Laureate's expression of regret that '[…] it has become next to impossible for a single mind fully to command more than a small specialized portion' of the existing vast amount of knowledge. According to Schrödinger, the only way out of the above formidable difficulty is 'that some of us should venture to embark on a synthesis of facts and theories, albeit with second-hand and incomplete knowledge of some of them'.

I fully embrace the significance of the above appeal. Recognizing that this problem is indeed unsurpassable, especially since general knowledge has grown immensely in the last fifty years, I will attempt a less ambitious project. My aim is to present a proper *framework capable of approaching knowledge and understanding in the unified, all-embracing manner* envisioned by Schrödinger. This approach has become possible as a result of the remarkable progress achieved since the turn of the millennium regarding the *functioning of the brain*. For example, it will be shown that there now exist appropriate tools for elucidating the mechanisms responsible for the human 'quest for unification,' noted by Schrödinger. My attempt to delineate the above approach has been motivated by the privilege of a broad education in engineering, mathematics, physics, and medicine, as well as my exposure to a wide range of areas through research activity and published work.[2]

[1] E. Schrödinger, *What Is Life? The Physical Aspect of the Living Cell* (Cambridge University Press, 1944).

[2] From differential equations and the Riemann zeta function, to symmetries and geometry; from the general theory of relativity, to particle physics; from protein folding and chronic myelogenous leukaemia,

The grand illusion

Answering the question 'what is consciousness?' is considered one of the most important open problems in the history of sciences. Many deep scholars have written extensively on the subject, approaching it from a variety of angles, including neuroscience, artificial intelligence, philosophy, mathematics, and physics. It has even motivated works of literature.[3] As discussed in the last chapter of this volume, I believe that this problem *can* be solved, provided that it is correctly defined and is placed in the proper perspective. In my opinion, this requires the acceptance of the fact that *unconscious and conscious processes form a continuum*, along with the *primacy of the unconscious*. In this connection, motivated by the analysis of a plethora of neurophysiological studies, including the detailed scrutiny of visual perception presented in chapter 4, I postulate that

every conscious experience is preceded by an unconscious phase.

Let me clarify the critical importance of unconscious processes by using a simple example. My wife, Regina, enters my study in our house in Cambridge. As a result of intricate processes that are *entirely* unconscious, *my brain* perceives Regina. I will refer to the *unconscious construction* of this percept as the *mental representation* of Regina. About a third of second later, *my brain informs me of what it already knows*. Namely, my unconscious informs my consciousness of the presence of my wife. At this moment, the miracle of awareness takes place: I perceive Regina. I will refer to the *conscious construction* of this percept the *mental image* of Regina. As soon as unconscious processes begin to construct the mental representation of my wife, these processes simultaneously form infinitely many *associations* related to her. Consequently, my unconscious decides that I should greet Regina with the statement 'Good morning, my love'. About a third of a second later, it instructs my consciousness to implement this decision. My wife's unconscious perceives my greeting, and then, it informs her consciousness; etc.

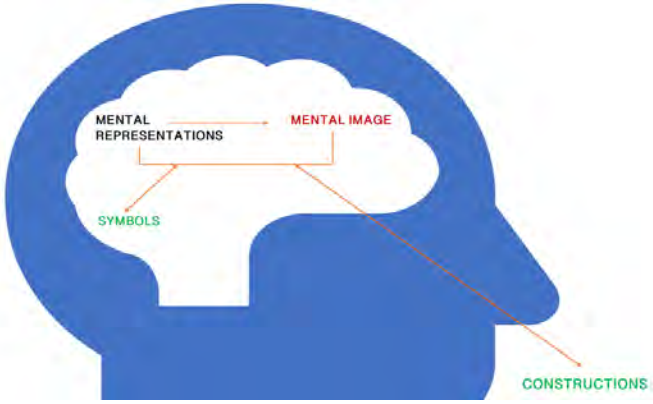
Mental images (3D holograms) are continuously updated, but they are always 0.3–0.5 of a second *behind* reality. Consequently, the interaction with the external environment in 'real time' is, paradoxically, the task of the unconscious and *not* of consciousness. Indeed, it is intricate *unconscious* processes that allow us to walk, to drive without crashing, to hit or catch a ball, to see glimpses of colors, etc. We erroneously believe that our *conscious self* is in charge of our communications, actions, feelings, etc. In reality, our consciousness is nothing but the 'faithful assistant' of the unconscious. I refer to this remarkable, but largely unappreciated fact, as the 'grand illusion'. Following the groundbreaking work of the neurophysiologist Benjamin

to mathematical models for *C. elegans* and for aspects of Covid-19; from medical imaging and 'deep learning', to philosophy and the quantification of fractality in paintings of Piet Mondrian.

[3] T. Stoppard, *The Hard Problem: A Play* (Grove Press, 2015).

Libet (which will be discussed in a future volume), this illusion has been discussed with regards to 'decision making' (free will).[4] However, as evident from the above example, the fact that awareness *always* lags a considerable amount of time behind unconscious processes, underlines *every* mental function of *any* organism possessing consciousness. In this sense, the label 'grand illusion' is, hopefully, well justified.

In contrast to our evolutionary predecessors, we have the privilege of possessing language. Undoubtedly, this enormously enriches our capacity to communicate. For example, instead of the statement 'Good morning, my love', animals must use a variety of indirect ways to communicate their emotions. As a result of the transformative impact of language, many scholars have highlighted this great gift as the *key* difference between us and other creatures possessing consciousness. In my opinion, this is *not* entirely correct. It is argued in this volume that our qualitative advantage in comparison to other animals is our predisposition to *construct real versions* of our mental images and our mental representations, *or to assign to them specific symbols.* I will label the emerging constructions or symbols *re-representations.* In addition to language, the re-representations of mathematics, computers, technology, and arts, are of crucial importance for the development of our culture. Regarding the arts, as noted in chapter 9, many great artists have explicitly stated that their creations often begin in their unconscious. This is consistent with my assertion that the origin of re-representations is not only mental images, but also mental representations. The above relationships between mental representations, mental images, and re-representations are indicated in the diagram below.



As a mathematician I have greatly benefited from this unique capacity of the human brain. Indeed, the thought process of a mathematician often compels them to *write* specific mathematical formulas. As soon as a formula is written, a dynamic interaction begins between this specific re-representation and related unconscious processes. This hugely generative process finally expresses itself with another

[4] D.M. Wegner, *The Illusion of Conscious Will*. Foreword by D. Gilbert. Introduction by T. Wheatly (The MIT Press, New Edition, 2017).

formula, etc. Generalizing this particular case, it becomes evident that the continuous and multilevel interaction between a plethora of re-representations and unconscious processes is the essence of the astounding human creativity.

The first 'big bang' in biological evolution was the emergence of consciousness, or more precisely, of the defining property of consciousness, which (as Libet pointed out) is *awareness*. In my opinion, the second 'big bang' was the emergence of re-representations. This is unique to humans; it constitutes, in fact, the birth of humanity. As a result of the unlimited richness of re-representations, the interaction of humans with their environment became far more complex than that of their evolutionary predecessors. To emphasise the highly dynamic and everchanging nature of this interaction, I will use the term *heterodynamics*. This also conveys the qualitative difference between this situation and the quasi-static state that characterises the internal environment of living organisms, called *homeostasis*. Heterodynamics, which is decisively affected by re-representations, dictates cultural evolution, and for humanity, this is far more important that biological evolution.

How do we comprehend?

The earlier postulate that unconscious processes are a necessary condition for the creation of a conscious experience implies that *anything* we do, think, and feel, is crucially affected by the 'echo' of processes of which we are completely unaware. In addition to the implications of this postulate for 'ways of comprehending', my further suggestions in this direction are based on a second postulate:

> *gaining deep insight necessitates the need to decipher fundamental biological, and especially neuronal, mechanisms.*

Such an analysis implies that the following notions are *indispensable tools for the comprehension of our thoughts, feeling, and actions, and more generally for the search for a hidden reality*:

> 'continuity', 'associations', 'interconnectedness', 'analogical thinking', 'continuity', 'abstraction', 'generalization', as well as the dialectic pairs of 'reduction versus unification', simplicity versus complexity', and 'local versus global processes'.

These notions are reflections of fundamental biological processes. For example, 'continuity' was already mentioned regarding the relationship between unconscious and conscious processes. Moreover, it was via 'associations' that my unconscious decided of how to greet my wife. The relationship of the other notions with specific biological and neuronal mechanisms will be discussed throughout this volume.

The usefulness of the above concepts will be illustrated by their employment in elucidating aspects of mathematics, physics, biology, neuroscience, medicine, technology, philosophy, and painting. In particular, mathematics and physics provide examples *par excellence* of 'generalization' and 'unification' respectively. Painting provides a plethora of examples of both 'reduction' (as in paintings by Mondrian, Malevich, and Rothko), as well as 'simplicity versus complexity' (as in paintings of Kandinsky, Picasso, and Braque).

The Concrete Outcomes of the New Approach

The integrative approach to knowledge and culture based on this proposed framework has several concrete outcomes, discussed below.

(i) It suggests a way for resolving the paradox between the abundance of information and specialization. In this connection, it is prudent to be aware of the confusion and misinformation generated by the current availability of massive amounts of data. This suggests that 'ignorance' is promoted from two opposite extremes: from too few or from too many data. The relationship between information, knowledge, and wisdom was succinctly expressed by T. S. Elliott: 'Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?'. This volume presents wide and interrelated knowledge. Moreover, it provides *a framework for the interested reader to transform some of the enormous amount of available data and dispersed information into knowledge*. Using the internet and a variety of other sources, material presented in this volume can provide both motivation and guidelines for acquiring additional information regarding a plethora of important areas. Incidentally, I envision a synergistic relationship between this volume and the web: the internet can immediately clarify the meaning of those concepts that I have not defined, erroneously presuming they are known. In addition, the web can be a source of supplementary information for many concrete entities and concepts presented here. For example, one may easily access the history of the paintings analysed in this book.

(ii) It introduces an *all-encompassing approach to sciences and humanities* that will hopefully help restore the arts and letters to their rightful position as the centre of the human existence. The human mental capacity for *computability* gives rise to the enormous computational capabilities of mathematics and the stunning achievements of artificial intelligence (and especially of 'deep learning'). As a result of these achievements, there is nowadays the illusion that algorithms are omnipotent. This illusion has regrettably led to many questioning the importance of arts and letters. Moreover, the arrogant claim that human thought will soon be surpassed by artificial intelligence has led to a distortion of our view of the essence of humanity. However, *mathemat-*

ics reflects only a limited subset of human thought, and artificial algorithms mimic only a small part of the brain processes. Indeed, artificial intelligence not only ignores unconscious processes but also the vital role of the glial cells, the differences in the functions of the two brain's hemispheres, and the crucial fact that the mind is *embodied*. Furthermore, the important *intrinsic limitations* of both mathematics and computing are not taken into serious consideration. In this connection it is noted that, in a similar manner that Ludwig Wittgenstein exposed the limitations of language, the brilliant mathematicians, Kurt Gödel and Alan Turing, rigorously established that *neither mathematics nor computing can reach the truth via a formal, axiomatic process.* In contrast to the current apotheosis of the rational and the algorithmic, the unified, balanced approach advocated in this book suggests that *a basic characteristic of creative ideas and advanced artistic representations is that they are non-verbal and non-algorithmic; they are transcendental. These mental creations are generated via the interaction of unconscious processes and re-representations in the dynamic environment of the embodied brain, which is crucially affected by hormones and other molecules excreted by the body proper.* Hence, I am highly sceptical as to whether such processes can be 'programmed'. Overall, the serious limitations of rationality, together with the pivotal role of the unconscious in arts and letters (that makes these creations even 'less programmable'), imply that in the 21th century, Humanities define what it means to be human *more poignantly than ever before*.

(iii) It demonstrates that *a unified, integrative approach* to knowledge *is* indeed possible. For this purpose, an effort is made to refute the myth that it is supposedly impossible to be both deep and broad. Actually, breadth and depth are not antithetical; they act synergistically. Indeed, *the more areas one is exposed to, the more extensive becomes the web of possible associations among elements and concepts of these diverse areas. Hence, the deeper the insight gained, the higher the appreciation for the value of arts and letters, and the more likely the attainment of difficult goals.* These diverse, positive experiences are accompanied by happiness, or more precisely by *eudemonia;* the state of elation and personal fulfilment achieved via pursuing *knowledge* and *beauty* and *attaining lofty goals*. The word eudemonia is of Greek origin; it derives from the prefix *eu*, meaning good, and *daemon*, meaning spirit. This concept was introduced by the ancient Greeks (in particular, it is discussed in Aristotle's monumental work *Nicomachean Ethics*) and was later elaborated by several scholars. This concept is much broader than *hedonia,* that derives from the Greek word *hēdonē,* meaning pleasure (hedonism, as envisioned by Aristippus, advocates maximizing pleasure). The joy and fulfilment that naturally accompanies the process of approaching the 'essence of things' has been perfectly expressed by Albert Einstein. Recalling the moment when he

conceived the basic idea behind his General Theory of Relativity, Einstein wrote that 'this was the happiest idea of my life'. Perhaps only the unique genius of Einstein, in addition to relating the seemingly far removed notions of gravity and acceleration, was also able to express so eloquently the sequel of any great achievement. He did not characterize his brilliant idea as the most profound or the most original, but simply as the happiest! Many deep thinkers have noted that understanding brings joy. For example, the philosopher Daniel Dennett, states that 'I find comprehension to be one of life's greatest thrills'.[5] The feeling of eudemonia associated with knowledge is consistent with the Aristotelian understanding that 'All men by nature desire knowledge'.[6]

Regarding beauty, it must be emphasized that aesthetic pleasure is not only found in the arts and letters, but also in many other endeavours, including mathematics, science, and technology. I am often mesmerized by music, painting, and poetry; but also by the beauty of several mathematical works. The high aesthetic value of the mathematical equations that express physical laws is perhaps a reflection of the beauty of the corresponding physical reality. Interestingly, there exist common neuronal mechanisms responsible for appreciating different aesthetic forms. For example, a study using functional MRI has shown that, when mathematicians are exposed to musical or visual beauty, there is activation in the same part of their brain as the part activated when they are exposed to a beautiful mathematical equation.[7] The relationship between beauty and mathematics is further discussed in chapter 18.

(iv) The approach introduced in this volume provides the proper framework for an illuminating discussion of several important questions which, in my opinion, should concern every educated individual. They include the following: What is the origin of the distinguishing mental advantages of humans in comparison to our evolutionary predecessors? What is the relationship between innate and acquired knowledge? What does it mean to 'understand' and how is insight achieved? Why is it possible for us to comprehend the universe? What is the effect of the cultural evolution on our brains? What is the neuronal origin of our emotional responses to arts and letters? Could the unbalanced emphasis on science and technology at the expense of arts and humanities 'end up downgrading humans' as Yuval Noah Harari worries in his *Homo Deus*?[8] Can the problem of consciousness be solved?

[5] D.C. Dennett, *From Bacteria to Bach and Back* (Penguin Press, 2017).

[6] '*Πάντες άνθρωποι του ειδέναι ορέγονται φύσει*'.

[7] In this study, there was activation in the medial-orbito-frontal cortex. Among equations considered beautiful were the one expressing Pythagoras' theorem, as well Euler's equation $e^{i\pi}=-1$ [S. Zeki, J.P. Romaya, D.M.T. Benincasa, and M.F. Atiyah 'The experience of mathematical beauty and its neural correlates', in *Front. Hum. Neurosci* 8 (2014)].

[8] Y.N. Harari, *Homo Deus: A Brief History of Tomorrow* (Harvill Secker, 2016) (Original publication: 2015 in Hebrew).

Why is beauty important in those mathematical expressions that capture basic physical phenomena? Can the impact of mathematics in biology be as essential as it has been in physics? The significance of the last question becomes evident by noting the claims of several leading neuroscientists that 'mathematics will be crucial for solving the problem of consciousness'.

(v) Studying this volume will allow the reader to become familiar with many facts that, because of their significance, should be widely known. For example, neuronal mechanisms related to unconscious perception and awareness will be discussed. In addition, it will be shown that the transition from the unconscious to awareness is not only relatively slow but, more importantly, it is accompanied by loss of information. For example, in the so-called 'binocular rivalry', analysed in detail in chapter 14, two *different* images are shown in the left and right visual fields. *Both* images are perceived unconsciously but we become aware of only *one* of them. This clearly shows that *our brains 'know' much more than we do*.

(vi) It is expected that the exposure to different areas of science and humanities will train the brain of young people to *adopt a flexible, multidisciplinary way of thinking*. In my opinion, this provides the best preparation for modern life, where lines between disciplines have become blurred. Most importantly, it will make available to the reader a *new methodology* that can facilitate their analysis of a variety of phenomena. In particular, it will allow them to comprehend the origin of their thoughts, feelings, and actions. This methodology is based on the understanding of the continuity between unconscious and conscious processes, as well as on the judicious employment of the tools mentioned earlier, namely, 'continuity', 'associations', 'interconnectedness', etc. I hope that researchers with various areas of expertise, after reading this volume will be motivated to revisit many disciplines including philosophy, literature, and social sciences, within the proposed methodology. For example, it will be interesting to elucidate how the extensive *network of associations* constructed by the brain motivates the creation of *social networks*. In this connection it is noted that social support, social relations, and friendship, are not only vital components of happiness, but also promote health and affect longevity. People with satisfactory social relationships improve substantially their chance of survival in comparison to those with poor ones.[9]

(vii) The book will expose the reader to elements of biology, neuroscience, medicine, mathematics, and physics in a clear and comprehensible manner. In addition, the reader will be exposed to the stunning recent developments in brain imaging, which allow observation of specific functions of the brain in real time. This achieves a double goal: on the one hand, these elements

[9] J. Holt-Lunstad, T.B. Smith, and J.B. Layton, 'Social relationships and mortality risk: A meta-analytic review', in *PLoS Med*. 7.7 (2010).

provide *illustrations of the novel methodological approach to knowledge advocated in this volume*. At the same time, they offer *a global vista* of these important disciplines and developments. In particular, several chapters present a thorough introduction to neuroscience, from single neurons to various neuronal mechanisms crucial for perception, memory, and learning. In these chapters several important neurological diseases are discussed, and current treatments are noted. In chapter 21 the impact on medicine of mathematics, computer sciences, physics, chemistry, bacteriology, pharmacology, molecular biology, and immunology is discussed. This clearly establishes the interdisciplinary nature of medicine. Moreover, chapter 23 offer the reader extensive and useful information regarding the current very hopeful advances in cancer treatments.

Certainly, the deeper one explores different realms of human endeavours by employing tools elaborated in this volume, the more relationships one discovers. For example, science, with its emphasis on the rational and religion with its reliance on metaphysics, can appear completely antithetical. However, it turns out that, at a deeper level, science and religion, paradoxically, share some common ground. Indeed, taking into consideration the limitations of the rational mentioned earlier, it follows that *the highest aspiration of science coincides with a fundamental goal of religion: it aims to go beyond the rational and to reach the transcendental*. In addition, it is well known that a key element of religion is the belief in a supernatural world. The creation, in the 'soul' of a religious individual, of this invincible, undefined, non-material world, *has its origin in similar neurological mechanisms* that give rise the remote 'echoes' reflecting deep, esoteric, unanswered questions of science, in the brain of a mature scientist. These mechanisms are unknown processes (for the time of writing) that take place in the world of the unconscious. This fundamental characteristic of science was certainly recognized by Einstein, who wrote: 'The most beautiful thing we can experience is the mysterious. It is the source of all true art and science'.

The above remarks suggest that polemical conflicts between science and religion can be avoided. Interestingly, Father and polymath Marin Mersenne (1588–1648), considered 'the cause of science as the cause of God'. Mersenne was a friend of the great scientists Galileo Galilei, Rene Descartes, and Etienne Pascal. He was also in contact with Pierre de Fermat and tried to find a formula that would represent all prime numbers.[10]

It is remarkable that despite the enormous importance of unconscious processes, these processes remain largely undervalued. This is also reflected by the fact that psychiatry, which is the part of medicine mostly concerned with unconscious mech-

[10] Mersenne discovered the 'laws of stretched strings', namely, the formula expressing the frequency of the acoustic waves generated by a stretched string. After his death, his correspondence with Galileo, Fermat, Constantijn Huygens, Evangelista Torricelli, and other scientists, was found in his cell [Tononi 2012].

anisms, is underestimated and underfunded. Psychiatry comes from the Greek words '*psych*ē' and '*iatreia*', which mean 'soul' and 'healing', respectively, and perhaps the best interpretation of the notion of the *soul* is the *unconscious*. Considering the importance and prevalence of psychiatric illnesses, and especially of depression and schizophrenia, this lack of appreciation of the significance of psychiatry is utterly unfortunate. Hopefully, the elucidation of several aspects of the unconscious presented in this volume, will help towards elevating psychiatry to the level it deserves.

According to Aristotle, happiness is 'the end to which our actions are directed'. In my opinion, a crucial component of happiness is *diversity of positive experiences*. Concrete suggestions that may assist young people to achieve such diversity are presented at the end of the book.

In summary, this volume dares to suggest a unifying approach to life that is based on the elucidation of deep neuronal mechanisms, which finally lead to understanding and fulfilment. *Every thought and every activity gives rise to a multitude of associations and hence (if appropriately manipulated) to the potential for generating the feeling of eudemonia.*

Evolution, Genetics, and Nature: Implications for Orthodox

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In the science-religion community much effort is placed on doing 'evolution apologetics — i.e., defending evolution against creationism or intelligent design or some other form of fundamentalist perspective on human origins. This article will not engage in the usual apologetics as that has been done elsewhere (1–3) in depth.[1] Instead, this work will attempt to discuss evolution from the perspective of the implications it has for how we think about humanity now and in the future.

Life Is That Which Evolves

There are many definitions of life—that which is capable of reproduction, that which can metabolize, etc. One definition that seems fitting in this article is 'that which evolves'. Evolution was first defined in biology as a process by which natural selection chooses those species that are most fit to survive in their current environment. Biological evolution also implies that survival will permit procreation where the next generation will largely resemble the parental organism(s) that survived. The conveyers of evolution are genes, fragments of DNA that code for proteins that function in cells. Changes in genetic material are called mutations. On the level of organism, mutations can be beneficial, harmful, or neutral. Mutations can be beneficial in one environment and harmful in another. At the same time, mutants that are neutral (i.e., convey no advantage or disadvantage in a given environment) remain in the population in silence…and yet at some future time, these neutral mutations could become advantageous or problematic.

On Planet Earth, life became life when I became capable of evolving.[2] It is not known if this is the same on all planets (if there is life on other planets), but on this planet evolution is a pre-requisite for life. Evolution is a natural process, but it is also the reason for other 'natural' processes. Humans reproduce by sexual reproduction because evolution selected for it, and many species reproduce by asexual reproduc-

[1] G. E. Woloschak, 'The Compatibility of the Principles of Evolution with Eastern Orthodoxy', in. *St. Vladimir's Theological Quarterly* 55 (2011): 209–31; Gayle E. Woloschak, 'God of Life: Contemplating Evolution, Ecology, Extinction', in *The Ecumenical Review* 65.1 (2013): 145–59.

[2] Much of the description about evolution comes from textbook and Wikipedia information about evolution. One of the best evolution textbooks is D. Futuyama and M. Kirkpatrick, *Evolution* (Oxford: Oxford Univ. Press, 2018). Wikipedia also has a variety of different websites with accurate information on evolution, mutations, etc.

tion because evolution selected for it. Plants carry out photosynthesis because of evolution, mammals produce milk because of evolution, and every single biological process that occurs on this planet gradually came into being through evolution. Evolution is the underlying principle of all of life on earth and life cannot be imagined without it. Life cannot be understood without understanding evolution; scientists do not like to use the term 'law' when considering scientific principles (because all things must be continuously tested for accuracy). Nevertheless, evolution is one of those principles for which the data are so overwhelming that the fact that evolution occurs cannot be questioned although there can be many issues to be considered about the mechanisms of it.

Often in the Church there is a reverence for what is natural, and yet at the same time Orthodox accept medical treatments that are often 'unnatural'—the use of chemotherapeutic drugs that poison the cancer and poison the body, the use of genetic manipulations, etc. It is important that the Church rise above these natural/unnatural considerations and instead weigh the issues based on love for the other and on ethical expectations with a glance toward '*oikonomia*'. This will be discussed in the remainder of this paper.

Randomness of Evolution

Evolution is driven to a large extent by random mutations that occur and then get selected for or against (or remain neutral). This randomness of mutation induction is essential for evolution because without randomness species would not be able to adapt to a changing environment and the Earth could not sustain life. Many, particularly those in the Church, find it worrisome that randomness plays such an important role in creation, but this should not be surprising. Randomness allows for a creative and dynamic component in the process of creation and is essential not only for the evolution of species but also for the survival of each living organism. Many biological processes that govern our daily life occur through random processes. Among the most important for humans is the mechanism by which the immune system can generate sufficient diversity to fight every infection one might encounter in a lifetime, which involves a random mutation process that allows for millions of different permutations of immune molecules that fight infection to be generated. The most effective for binding to pathogens are selected for in infections. A few humans with diseases where this random process is damaged or nonfunctional in some way die of overwhelming infections unless they are kept in environments where they are unable to encounter infectious agents. Randomness is in-built into evolution and into biological processes as a whole. It is essential for life and without it organisms cannot evolve and species cannot survive. Randomness is a natural process. One can argue, then, that God creates using at least some random processes, although the exact role that God plays in this process may be a mystery.

The concept of natural selection, then, is one that states that nature selects for the organism that is best suited for a particular environment. This does not mean that this is the best possible design that one could develop or the best organism that lives in an environment—just that, of those available, this is the one that is best suited for a particular environment. Evolution can only select from that which exists and not from all variations that could ever exist. This means that often the species that is best suited for an environment is not the first one that is selected: i.e., species that evolve over time may be better suited for the environment than the first organisms that were selected. In addition, this means that many species reach extinction in a changing environment.

Evolution, because it is a random process, is not perfect. Life is not perfect, many aspects of humanity are not well-suited to the lives we live. Humans complain of lower back problems, are vulnerable to infections, and so many more imperfections that make humanity less than ideally suited for our environment. No species is perfectly suited to its environment, and with changing environments even the survivability of a species is short-lived. Evolution selects for those that can survive long enough to reproduce, and beyond that nothing is relevant.

Interplay of Environment and Evolution

An important aspect of evolution is the interplay between evolution and the environment. In other places I have made the point that the relationship between evolution and ecology is so strong that one cannot understand one without the other.[3] Evolution is dependent upon the environment; it is in the context of the environment that natural selection acts and selects for organisms that are best suited for living in it. However, over time environmental changes take place: the temperature in a given place goes up or goes down, sea levels rise or fall, a river dries up or becomes larger. Each change applies new survival pressure on the organisms that inhabit it. With each cycle of change the organisms that are best suited for the new environment survive better than their peers producing offspring that thrives more robustly. For example, as the temperatures warm, the organisms best suited for that location are not the same ones as those that lived in colder temperatures. Sometimes this means that individual organisms or even the entire species die, other times the few of the more aberrant representatives of a particular species survive (along with the genetics that caused it), and still other times organisms that are mobile move to remote locations that matched their original habitat. This close relationship between

[3] This point is made in the following article: Gayle E. Woloschak, 'Perspectives on Orthodoxy, Evolution and Ecology', in *Toward an Ecology of Transfiguration: Orthodox Christian Perspectives on Environment, Nature, and Creation*, ed. John Chryssavgis, Bruce V. Fotz, (New York: Fordham University Press, 2013), 263–75. In fact, the relationship between evolution and ecology is so close that often those that deny evolution also deny that concerns for the environment are important.

environment and evolution can go both ways: as the environment changes so do the organisms that are best suited for the environment, and sometimes the organisms of one species alter the environment. This creates a never-ending cycle of environment as a driver, organism as a driver, environment as a driver, etc. And, to make it more complicated, environment could be a driver for selection in one condition (temperature, for example), while the organism influences the environment from a different angle (pollution, for example) at the same time, making the habitats for itself and other species no longer habitable.

Some changes in the environment can be very dramatic and cause massive species extinctions creating an opening for the development of new species as a result. The early atmosphere of the earth was considered to have been rich in methane and gaseous hydrogen, which was favorable for the prebiotic (before life) synthesis of organic materials on the planet.[4] As blue-green algae evolved and was able to carry out photosynthesis, oxygen was produced; this occurred approximately 2.8 billion years ago. With this major change, the atmosphere of Earth transitioned from a reducing atmosphere, supportive of frugal anaerobic metabolisms suitable only for very small life forms, to an oxidizing atmosphere as exists on Earth today, which can now support large variety of species. Some have claimed that this 'great oxidation event' was one of the most important things to ever happen on this planet. Without it, there could never have been any animals that breathe oxygen: no insects, no fish, and certainly no humans.'[5] This extreme example demonstrates a very dramatic and significant interplay between evolution and environment. Most environment-evolution interfaces are more subtle and require specific study to uncover the roles of each.

Implications of Evolution for New Technologies

Evolution, then, has selected for the species that are best suited for a given environment, and biological processes ongoing in individual specimens of any given species today are those that best suit its survival in today's environment or in recent environments. A compendium of all of these processes is genetically regulated and biological selection of organisms with given traits ensures that genes regulating them persevere in a population. Genetic traits are generally either essential for life or carryovers from previous mutational events that give rise to advantageous or at least neutral mutations. This means that all of the biological processes human beings engage in have allowed our species to thrive until today. These include reproduction, eating and digesting food, the need for water, etc. Our biological existence

[4] 'Reducing atmosphere' from Wikipedia, https://en.wikipedia.org/wiki/Reducing_atmosphere (accessed 10 December 2019)

[5] Presented in the BBC 'Earth series' by Michael Marshall, July 2015. http://www.bbc.com/earth/story/20150701-the-origin-of-the-air-we-breathe (accessed 10 December 2019)

is a result of our species evolution so far. A question that results from this then is how much humanity should be revering our evolution and calling those biological traits that have been most successful so far 'natural', with a corollary that whatever is 'unnatural' today should be morally forbidden simply based on the fact that it was not (yet) selected for by evolution. This question has broad applications to ethical perspectives on 'un-natural acts' such as in vitro fertilization (IVF), genome editing, vaccines, and others.

It should be noted that throughout history, prior to the addition of any new technology to the toolbox of medicine there has always been the argument that the newly added treatment is unnatural. The treatment of infections with antibiotics was unnatural (even if the antibiotics came from fungi or other natural products), treatment of cancers with radiation or chemotherapy was unnatural (even though radiation is natural at least at low doses and many of the most potent chemotherapy drugs come for plants and other natural sources).[6] Cancer therapies were especially difficult because they involved poisoning the cancer and poisoning the body as a result; the use of a poison was definitely unnatural. These all involved therapies that eventually became standard of care, but the initial reactions in the broad community (including many in the Church) were often cautious and many even sought to limit the treatment. Eventually most religious groups, including the Orthodox Church, accepted these technologies as appropriate for the diseases in question. Despite these considerations, there is no doubt that discernment must be used in treating cancer, balancing quality of life and survival.[7] Certainly pastoral discussions often lead to difficult decisions about continuing or stopping therapy decided on a case-by-case basis. There is an underlying attitude today that as technology moves into the future the Church will inevitably begin to accept it slowly and lagging behind the developments. This suggests then that there is an expectation that many questions humanity has about various approaches and their use today will disappear as time passes and the uses of such approaches becomes commonplace.

There are some technologies that have been implemented with very little discussion from the broad community about ethics or appropriateness, and yet they have had a huge impact on human evolution and survival. Among the most important was the development of the Caesarian-section or C-section. When a baby was considered to be breech in the past, the physicians did the best they could but often the child's life was lost in the course of the birth because the baby came through the birth canal in the wrong position. With the advent of C-section surgery, the baby could be removed successfully and the mortality of babies at birth was drastically

[6] https://www.reactgroup.org/toolbox/understand/antibiotics/development-of-antibiotics-as-medicines/ accessed 19 Nov 2019

[7] For a discussion of cancer, evolution, and pastoral concerns see: L. Hummel and G.E. Woloschak, *Chance, Necessity, Love: An Evolutionary Theology of Cancer* (Wipf and Stock, 2017); L. Hummeland G.E. Woloschak, 'Chance, Necessity, Love: An Evolutionary Theology of Cancer', in *Zygon* 51.2 (2016): 293–317.

reduced. Nevertheless, this process was not a natural birth but rather a physician-assisted planned surgical birth. An unexpected consequence of C-sections was the larger head sizes (leading to larger brain capacity) in humans because no longer was head size limited by the size that would fit through the birth canal.[8] C-sections were employed without much thought about unnatural forms of birth, impact on human evolution, or impact on the human population as a whole. Why is this form of birth intervention considered acceptable with little discussion and other types discussed below are controversial and raise red flags, particularly in the Church community?

In Vitro Fertilization and Reproductive Technologies

What is In Vitro Fertilization (IVF)? It is the process of fertilizing an egg (oocyte) removed from a woman and placed in a test tube with sperm and allowing the process of fertilization to take place in the test tube. Usually, the *in vitro* fertilized egg is permitted to divide several times and then is implanted in the womb of a woman who has been made to be pseudo-pregnant (or has the physiologic changes of pregnancy) through the use of hormones. Usually, several such fertilized eggs are implanted in the womb to ensure that at least one will take and that a healthy baby will result. Such IVF-generated embryos cannot develop into a baby unless implanted into a womb, and thus a womb is a prerequisite for human life right now. (Some efforts are underway to create an artificial womb, but this has proven very difficult.)[9]

When it comes to modern technologies, many, particularly officials in the Roman Catholic Church, are opposed to IVF because it allows for an unnatural process (creating embryos by a process that begins in the test tube) that replaces usual sexual reproduction (the form of reproduction as a result of human evolution) as a means of producing offspring. The Orthodox Church has taken a mixed perspective on this with some bishops giving a blessing for IVF in the creation of children for husbands and wives that have 'infertility disorder'. Other bishops as well as the social-moral documents from the Russian Orthodox Church have condemned IVF because it is unnatural and introduces a foreign element in family life. It has been noted that IVF is also a means by which people can 'play God', giving naturally childless couples the opportunity to have children. Whether those opposed to IVF on these grounds know it or not, the natural process that is being lifted up here is that of evolution,

[8] P. Mitterroeker, S.M. Huettegger, B. Fischer, M. and Pavlicev, 'Cliff-edge model of obstetric selection in humans', *Proc. Nat. Academy of Sci USA* (2016) 113: 14680–5. There is ample work in the literature to support this model that C-sections are likely to permit larger head size in humans now but probably even more extensively in the future.

[9] Some of the basics about IVF can be found on the web: https://www.mayoclinic.org/tests-procedures/in-vitro-fertilization/about/pac-20384716#:~:targetText=In%20vitro%20fertilization%20(IVF)%20is,by%20sperm%20in%20a%20lab. Accessed 19 Nov 2019. For an article examining some Orthodox perspectives: G.E. Woloschak, 'In Vitro Fertilization and the Beginning of Human Life', in *The Wheel* 11 (2017): 11–16.

making that which evolution has selected as being 'God-given'. One can argue that new technologies are also God-given, being the result of human intellect and human creativity, both of which are gifts from God.[10] Nevertheless, knowing how to discern proper use of this technology is important as any technology can be used for good or bad, for benefit or for harm. One need only consider cell phone, which can call an emergency vehicle in a health crisis or become addictive and lead to obsessive use, to realize the values and concerns about technologies.

IVF has become common, and it is estimated that there have been at least 8 million IVF children born in the last 40 years with numbers up to 500,000 per year.[11] It has become an accepted technology, the costs have gone down over the years, and more families can afford IVF as an option for pregnancy. Anecdotal evidence suggests that among Orthodox families, few seek the Church and advice from their spiritual fathers prior to going through IVF. While many Orthodox bishops have admitted to giving blessings for IVF (always with the caveat that the egg and sperm come from the parents and that the wife will carry the child; often with the caveat that only a few fertilized eggs be generated in vitro so that there are no left-over embryos). In the beginning, there were concerns that IVF would generate some birth defects that would have been selected against by a natural pregnancy, but this has not been the case.[12]

Where IVF procedures may be drawn into concerns beyond treatment of fertility disorders is in the selection of the characteristics of the child. In parallel with IVF, procedures for the evaluation of nascent embryos were developed and single cell or few cells were extracted (without hurting future development of the embryo) in order to evaluate if all the chromosomes were in place, etc. With the development of rapid genetic testing procedures, we are now capable of establishing whether an embryo would develop into a healthy child or if it would inherit a genetic disorder that one of the parents may have or carry a mutant gene for. This then means that IVF allows 'pro-implantation' genetic testing — allowing development only of those embryos that would not be affected by a genetic disease. While some of the IVF clinics limit their efforts to such testing, others will also allow future parents to decide about other traits of their future offspring such as hair color, eye color, sex, etc. There are companies that advertise services that include not only IVF but also selection of specific one or few of the fertilized embryos with specific traits for implantation into the womb. The Orthodox Church has taken no official position on the selection of traits of offspring, although few if any Orthodox bishops that have given a blessing for IVF would have permitted selection of traits in the offspring.

[10] Several articles on the value of technology as a gift from God can be found in G.E Woloschak, *Faith Science Mystery* (Alhambra, CA: Sebastian Press, 2018).

[11] https://edition.cnn.com/2018/07/03/health/worldwide-ivf-babies-born-study/index.html#:~:targetText=Conception%20through%20science&targetText=The%20presentation%20estimates%20that%20more,2%20million%20treatment%20cycles%20performed. Accessed 19 Nov 2019.

[12] For a discussion of this: https://rscbayarea.com/blog/birth-defects-ivf accessed 19 Nov 2019

One question of course is why parents who are childless would want to select eye color or hair color or even the sex of the offspring. Intention is important here and could be of help in discerning whether trait selection is ethically appropriate. While some examples of trait selection are clearly frivolous: wanting a child that fits their image of a perfect child, etc., others deserve at least a pause. For example, there is one example from the US where a family selected for a second child with the exact type of cell surface proteins that would permit her to be a compatible bone marrow transplant to their older child who was suffering from leukemia. Little work has been done on examining the motives and intentions of the families and on discussing bioethics of this selection from an Orthodox perspective.

Another concern that is likely to alarm many ethicists and theologians is the possibility of creating parthenotes. These would either be embryos from a single ovum that has been forced to double its genetic material with electrical currents, resulting in a child that would contain genetic material from only a single female; or embryos derived from two female oocytes that would contain genetic material from two different females. The goal of these approaches is to develop embryos without the use of sperm. What would be the further destiny of such embryos has not been discussed—one can imagine a wide spectrum of uses and abuses of parthenote babies should they be implanted and brought to term. Human parthenotes have been created at least twice in the test tube but the procedure was stopped at that time.[13] The merging of two oocytes has been difficult to achieve due to factors unknown about the human reproductive process. The merging of two sperm is more difficult to consider predominantly because sperm are streamlined for mobility and contain none of the sub cellular structures (e.g., almost no mitochondria needed for the energy hungry process of rapid cell divisions needed for embryogenesis). While the processes examined here totally overturn evolution by creating children without sexual reproduction or even without using both sexes, it is possible that they will come to pass in the future. Church reflection on this issue would be difficult. As has been noted above, the argument that parthenotes are 'unnatural' may not be sufficient to dismiss this question.

Reproduction by parthenogenesis from a single ovum would be dangerous for humanity from a genetic perspective predominantly because a simple duplication of one set of genes in humans could lead to an enhancement in any problems that involve recessive genes. In the process of merging two cells in reproduction an individual inherits one copy of each gene (in general) from each parent, the likelihood of obtaining one 'regular' gene from one of the parents decreases the danger of developing a genetic disease if genetic material from one of the parents includes a mutant gene. However, if all genetic material of a new embryo came from duplication of a single cell from one person, then a simple duplication of a genome with one bad

[13] For a discussion on human parthenogenesis, a good review is available: G.J. deCarli and T.C. Pereira, 'On human parthenogenesis', in *Medical Hypotheses* 106 (2017): 57-–60

copy would result in an embryo with both bad copies leading to increased disease frequency. This process is called 'loss of heterozygosity'. This would be dangerous for the human population because it would lead to greater frequencies of disease-associated mutations that would normally be diluted out by combining two different genomes from two individuals. If the Church does not argue against single ovum parthenogenesis based on 'unnatural' processes, the introduction of a genomic risk to the human population would be a reason to veto this approach to reproduction.

Gene Editing

Gene editing technology has been revolutionized in recent years with the development of CRISPR, a technique that allows for the editing of a gene with few off-target effects (i.e., no effects on other genes in the genome).[14] The US National Academy of Sciences convened an international committee to examine CRISPR-based gene editing from biomedical, research, and ethical perspectives.[15] This group made recommendations that included at least initially limiting gene editing technology to only somatic cells (cells that make up the body) and waiting until more is known before moving into germ cells (eggs and sperm as well as embryos).[16] Edits in somatic cells come with some risks to the individual, but edited genome of somatic cells will vanish when the person dies. Edits to germ cells can be passed on in the genetic material of the parents to the offspring; any errors that might result in this process could in that case enter the human population for generations with no way to limit it. As yet, CRISPR still comes with some risks and some off-target effects. As this technology becomes perfected, however, risks of adverse effects will go down and the technique can become more generally applicable. Another broad concern about editing germ cells is the time required to follow individuals to be certain that there are no genetic risks; this would involve long-term follow up through multiple generations, an approach that will be difficult using current scientific approaches.

How does CRISPR feed into the evolution issue raised above for IVF? Clearly, evolution has allowed for selection of particular genes, some of which have negative effects, and it is not clear how it would be wrong to eliminate these from the human population. One concern to this approach, however, is that often humanity does not have the scientific understanding as to why particular mutations have been selected for (or against) in a particular environment. One example where there is a scientific

[14] G.E. Woloschak, 'Human Subjects and Human Rights', in *Human v Religious Rights: German and US Exchanges and Their Implications*, ed. G. Roeber (Vandenhoeck and Ruprecht Press, 2019), in press.

[15] National Academies of Science, Engineering and Medicine: Human Genome Editing: Science, Ethics, and Governance (Washington, D. C., 2017). Available at http://www.nap. edu/24623, accessed 19 Nov 2019.

[16] This system was first defined in bacterial systems in the paper Bolotin, A. / Quinquis, B. / Sorokin, A. / Ehrlich, S. D.: Clustered Regularly Interspaced Short Palindrome Repeats (CRISPRs) Have Spacers of Extrachromosomal Origin, in: Microbiology 151/8 (August 2005), 2551–2561. For a brief review of the history of CRISPR, Lander, E. S.: The Heroes of CRISPR, in: Cell 164 (2016), 18–28, is also important.

understanding is sickle cell anemia, where having two mutant copies gives rise to having sickle cell anemia, a disease where those affected die from poor transport of oxygen to the lungs unless they are able to receive frequent blood transfusions. There is very little difference, however, between having two normal genes or having one normal and one mutant genes with regard to oxygen transport. Nevertheless, those individuals that have one normal and one mutant are resistant to certain infections including malaria and some others. Total removal of this gene from the human population might leave an infection-susceptible humanity particularly in areas where malaria predominates.[17] Another recent example that has come up for discussion centers around the BRCA1 gene; when present in two copies, women have a higher risk of developing breast cancer, but when present in one copy, women produce more milk and have improved fertility.[18] Again, would reduction of this gene from the human population affect fertility in some way? What becomes even more difficult is when considering interacting genes: there are many traits that are multi-genic, which means that multiple genes are involved often interacting with each other. These are complex traits and it is hard to pull apart what each gene contributes and even which genes contribute. For example, in the past few years, schizophrenia has been studied genetically, and over 120 genes were found to be related as well as a variety of other interacting genes; only some of the genes were identified.[19] Considering that humans have less than 30,000 genes to conduct all biological processes throughout life, many of our genes act different roles in different biological pathways in different cells of our bodies. According to an estimate from 2011 as many as 17% of all genes involved in complex diseases have functions in more than one biological process.[20] Disruption of one particular gene among these could inadvertently affect a variety of different pathways gene traits.

As a counterbalance to these concerns are individual issues where families have to handle difficult genetic disorders such as Huntington Disease, Muscular Dystrophy, or Cystic Fibrosis, where changes in the somatic cells cannot correct the problems, and germ-line correction becomes the only hope for a cure for these diseases.[21] Genetic counselors, health care providers, and others treating these patients argue strongly that families suffer significantly as a result of these diseases; with a cure in the hands of humanity, they argue strongly that it is unethical to not employ CRISPR germ-line treatments.

[17] C. De Lange, 'How sickle-cell carriers fend off malaria'. *New Scientist* (2011) 2811 taken from *Cell*, (2011) DOI: 10.1016.

[18] F. Kwiatkowski, M. Arbre, Y. Bidet, C. Laquet, N. Uhrhammer, Y.J. Bignon, 'BRCA mutations increase fertility in families at hereditary breast/ovarian risk', in *PLoS One* 10.6 (2015): e0127363

[19] Schizophrenia Working Group of the Psychiatric Genomics Consortium (with over 300 collaborators). Biological insights from 108 schizophrenia-associated genetic loci. Nature (2014) 511: 421–7.

[20] S.Sivakumaran, F. Agakov, E. Theodoratou, J.G. Prendergast, L. Zgaga, T. Manolio, I. Rudan, P. McKeigue, J.F. Wilson, H. Campbell, 'Abundant pleiotropy in human complex diseases and traits', in *Am J Hum Genet.* 89.5 (2011): 607–18.

[21] https://www.labiotech.eu/tops/crispr-technology-cure-disease/ accessed 19 Nov 2019.

What is similar to the IVF discussion above is that evolution acted through natural selection to make the humans of today look and behave as they do in majority and one must ask whether it is suitable for Christians to dismiss those of us who are in minority as non-natural. MUST we accept what evolution has given us (because it is natural, God-given) or can we change it using technology (which is also God-given)? Perhaps in an environment without changes we could settle for genomes that are all the same; in the real life, with the changes that come with time survival of our species may well depend on those who are genetically in minority at present. What is different from the IVF discussion, nevertheless, is the concern about editing genes in the germ line where we do not fully understand the context of particular genes; a gene can cause different changes in different contexts as noted above. Risks inherent in editing genes that are multi-functional may limit the utility of germ-line alterations—but not so much from a fear of doing 'unnatural acts' or tampering with nature as concerns about making changes without knowing all of the consequences.

Gene editing of somatic cells does not have the inherent risks of that of germ-line cells in that the somatic cells will die with the individual. Since genes in the somatic cells came from genes in the germ cells (eggs and sperm) they too are the product of evolution. Prediction of genetic effects in a single individual are often less complicated than prediction of genetic effects on an entire population. It is hard to imagine how the introduction of a new gene or removal of an existing gene might play a role in the population, but within an individual that is slightly easier to discern; the person's entire genome is possible to sequence and the theoretical determination of at least some known genetic interactions would be possible to examine. While one could argue that any gene editing is unnatural, NOT performing gene editing to eliminate diseases is in some ways claiming that human evolution is special and that we should hold it in such high regard that we are willing to sacrifice human health in its honor.

Vaccines

Vaccinations began with Jenner in 1796 and his vaccine to treat the debilitating disease of small pox. This vaccine involved using a modified version of the small pox virus to force a person to create an immune response that would eliminate the true virus from the system.[22] This is a form of selecting the immune system's cells that identify and attack the disease using the complete pool of cells recognizing a wide array of targets generated by this innate random diversity generation process. Selection of cells in order to induce an immune response is something that happens naturally, but in different people this process takes different amount of time. For

[22] Wikipedia has a great deal on the history of the smallpox vaccine: https://en.wikipedia.org/wiki/Smallpox_vaccine#:~:targetText=Smallpox%20vaccine%2C%20the%20first%20successful,cowpox%20protected%20against%20inoculated%20smallpox. Accessed 19 Nov 2019.

some, immunity against certain infectious targets may be so delayed that they would die before immune defense can be mounted. Vaccination speeds the process along and gives the immune system of those who are vaccinated a head start in this fight. Nevertheless, while some may consider this an 'unnatural' approach, it should be mentioned that for any human disease so far, from the Plague to HIV, some individuals have a resistance that has developed through evolution. Through these few individuals and without vaccinations, natural selection would provide that human species continues to exist made of children of those who are resistant to the disease. The process would take a long time and would be accompanied with the death of countless human beings. In essence, vaccines speed up evolution and make a population able to fight infections that would otherwise kill or debilitate a large percentage of the population.

Like most technologies, vaccines were considered unnatural and dangerous, but with time vaccines became more accepted in the population. Vaccines became required in the US with implementation by requiring children to be vaccinated prior to attending schools, and this was effective in limiting diseases in the population: small pox, measles, tetanus, pertussis, mumps, polio, and others. Some of these diseases were close to being eliminated from the human population as a whole. One can claim that with vaccines, humans were modifying evolution by removing certain viruses from the human population. Viruses specific for these vaccines were stored in freezers around the world as a safe-guard for future needed vaccine development and could be available if there was some danger that came about by eliminating these viruses.

In the past few years, some people (including those in the Church) have developed an aversion to vaccines for two main reasons: (1) concerns that vaccines cause autism and other disorders in children and young adults[23] and (2) concerns that the approach for vaccine development requires the use of aborted fetuses. The evidence that vaccines cause autism is not to be found in the academic literature but is based predominantly on anecdotal stories from families of affected children. The entire hypothetical relationship between autism and vaccine use has been debunked repeatedly in the media, the medical and scientific literature, and in major conferences world-wide. Despite these reports, the false idea that vaccines cause autism persists in the minds of many and limits vaccine use. There are several other diseases that have been falsely attributed to vaccines, but autism has been the most prominent.

The second concern has been more difficult to consider. In the world, several cell lines from aborted fetuses are used for development of a few vaccines. In the US and most western countries, the vaccines that require the use of fetal cells are those against rubella, varicella, and hepatitis A. Two fetal cell lines used for production

[23] There are numerous articles on this, a key example: Plotkin, S., Gerber, J., and Offit, P. A. Vaccines and Autism: A Tale of Shifting Hypotheses. Clinical Infectious Diseases (2009) 48(4): 456–61; the article is available for download at: https://academic.oup.com/cid/article/48/4/456/284219 accessed 19 Nov 2019

were derived from cells from two different therapeutic abortions in the 1960s and no new aborted fetuses have been needed since that time. These same cell lines are used to grow all vaccines today. Attempts have been made to use non-fetal cells for the development of the vaccines, but they have not been effective. For this reason, many people, including some Orthodox Christians, have taken a strong stand against vaccine use, which has resulted in outbreaks of measles in a variety of different schools throughout the US and elsewhere. Guarding the public against serious diseases with vaccines does not require that 100% of people be vaccinated because scientists have shown that 'herd immunity' will protect those who are unvaccinated. This means that infection occurs at a lower rate if fewer people can be infected with an organism (i.e., transmission is reduced if there are fewer people to transmit the infection). For different infectious organisms, different percentages of people are required for herd immunity: for measles virus (which spreads quickly), about 90% of people must be immunized while for polio only 80% must be immunized. The large outbreaks of measles in New York City, for example, demonstrates that fewer than 90% of the population has been immunized; measles is a dangerous disease that impacts the entire immune system of the individual and can lead to death.

The Roman Catholic Church has taken the position that, while the use of aborted fetuses is not appropriate or ethical, two factors influence their approval of vaccines: that the vaccines save countless lives and that no new aborted fetuses are being used for this work.[24] Most Orthodox bishops have taken a position that echoes the comments of the Roman Catholic Church (although this has not been any type of official pronouncement) supporting the use of vaccines with the caveat that no new aborted fetuses will be used. Despite these positive reflections, some attitudes have remained intransigent and difficult to change. These arguments are not based in thinking that the vaccine is unnatural but rather the concept that abortion is wrong and therefore the use of aborted fetuses is wrong. Orthodox parishes and schools have struggled with parental concerns about the use of vaccines.

It is not clear what can be done to remedy these concerns. The first concern (autism) is based on misrepresentations in sensationalist media and can perhaps be handled with the education of the public. The second, however, must reside in the domain of the bishops who can perhaps allay ethical concerns about vaccines and their development. Pious Christian concerns need to be weighed against the public good gained from vaccination through the release of official pronouncements in order to erase any ambiguity on the matter. The number of lives saved from vaccination is estimated to be very high.

[24] A.R. Luno, 'Ethical reflections on vaccines using cells from aborted fetuses', in *National Catholic Bioethics Q* 6.3 (2006); 453–9. A number of hospitals advertise the Roman Catholic position to encourage vaccine use: https://khn.org/morning-breakout/catholic-church-has-given-green-light-to-using-vaccines-derived-from-aborted-fetal-cells-but-one-family-is-still-suing-over-beliefs/

Perspectives

Several key points echo in the comments above relating evolution, technologies, and the Church.

1. The claim that certain processes are 'not natural' in almost all cases relates to our evolution as Homo sapiens. Humans are everything we are biologically because of evolution: our metabolism, our methods of reproduction, our propensity to different infections, our tendency to develop cancer, etc. While many Orthodox claim that that what is natural is what is right, natural is in these cases considered that which is apparent in the majority of human population – something that came from natural selection based on our recent and current environment. Making that claim leads to concerns that include too great a reverence for humanity's evolution and ignoring many technological procedures that are commonly used and are not challenged by the Church.
2. There are valid reasons to limit the use of certain applications of technology, many of which involve concerns about how a technology might impact the biological future and safety of humanity as a population. The ethical consideration of technologies should always include some discussion about how humanity's future could be impacted. It is the responsibility of this generation to safeguard the future ones.
3. Technologies that are used must provide benefit and not be used frivolously or for causes where alternative treatments are available. They should save lives or provide for some treatment for conditions with no other approach for therapy. Special care must be taken when limiting interventions for dangerous or debilitating diseases since human lives and families are so severely impacted by these disorders.
4. Decisions of appropriateness of different technologies often require discernment on a case-by-case basis; not all cases of cancer are the same, not all treatments are the same, not all cases of particular diseases are the same. What works for some does not work for all, and decisions about one do not always apply to all.

In conclusion, many in the Church exclaim that they see the mark of 'unnatural' in processes that are not autonomous biological processes, failing to see that our daily lives are already inundated with processes where we 'aid nature' with such health interventions as C-section or tooth cleaning. We should not forget that many Neanderthal remains show signs of death from jaw inflammation from bad teeth. Many also find the 'unnatural' in fellow human beings who diverge from the average because of their looks or behavior or any other non-majority feature. In this case – we need to remember evolution and from two different angles. First — we are all members of our species and a new disease without a vaccine or swift climate change may quickly change the odds for survival of those of us who are currently

in majority. Secondly — we recognize as 'natural' simply that which is currently most prevalent in our species because evolution has favored it so far. However, the human species is capable of more than reproduction and if we are children of God, he probably appreciates more than our procreation.

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