# INTERNATIONAL CONFERENCE

# "SCIENCE AND RELIGION"

# PROCEEDINGS


3-5 SEPTEMBER 2015


Project NARSES – ARISTEIA

Institute of Historical Research

National Hellenic Research Foundation



ΕΘΝΙΚΟ ΙΔΡΥΜΑ ΕΡΕΥΝΩΝ
National Hellenic Research Foundation

Hpdst History Philosophy & Didactics of Science & Technology

Ευρωπαϊκή Ένωση
Ευρωπαϊκό Κοινωνικό Ταμείο

ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΠΡΟΓΡΑΜΜΑ
ΕΚΠΑΙΔΕΥΣΗ ΚΑΙ ΔΙΑ ΒΙΟΥ ΜΑΘΗΣΗ
ΥΠΟΥΡΓΕΙΟ ΠΑΙΔΕΙΑΣ ΚΑΙ ΘΡΗΣΚΕΥΜΑΤΩΝ
ΕΙΔΙΚΗ ΥΠΗΡΕΣΙΑ ΔΙΑΧΕΙΡΙΣΗΣ
Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης

ΕΣΠΑ 2007-2013

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ISBN: 978-960-9538-43-5



Athens 1915

# TABLE OF CONTENT

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# INTRODUCTION

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The Institute of Historical Research of the National Hellenic Research Foundation and the Department of Education of the National and Kapodistrian University of Athens organized the International Conference "Science & Religion" in Athens, 3-5 September 2015. The website of the Conference is: http://conferences.hpdst.gr/science-religion.

The Conference was associated with the NARSES Research Project **(**Nature and Religion in South Eastern European Space: mapping Science and Eastern Christianity relations in South Eastern Europe and Eastern Mediterranean - http://narses.hpdst.gr/) and was the final event of this project. NARSES aimed to map the relationship between sciences and Orthodox Christianity from the 4th c. AD to the 20th c. in Southeastern Europe and the East Mediterranean. It focused on social formations where Eastern Christianity was the dominant religious tradition ansd its purpose was to contribute to fill an important gap in the historiography of science. Indeed, while a huge literature exists on the relations between science and religion in the context of Western Christianity, very few is known about the history of these relations in the areas of Byzantium, the Ottoman Empire and the Balkan states, marked by Eastern Christianity. NARSES project aimed to present the Greek language sources by collecting, critically examine and catalogue the texts where the conceptualizations of God intersect with the conceptualizations of nature (religious texts on nature, and scientific texts evincing theological concerns).

The International Conference "Science and religion" highlighted interdisciplinary research to reveal unknown dimensions of the science-religion relation with major implications for the historiography of science developed with reference to both Western and Eastern European societies. It gathered experts of the two fields with the purpose to make known the recent developments of science and Orthodoxy studies to the international community of historians of science and religion. Therefore, the papers of the conference range from Antiquity to contemporary history; they cover a very large geographical area and are written by historians of science, philosophers, historians of ideas, theologians and physicists.

# 1. SCIENCE – ORTHODOXY DIALOGUE

# IS THE CURRENT WESTERN DIALOGUE BETWEEN SCIENCE AND THEOLOGY RELEVANT TO ORTHODOX CHRISTIANITY?

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## Introduction

The future response of Eastern Orthodox theology to the sciences is not fully predictable, since three strategies may be seen in the recent literature. One of these strategies (e.g. Sherrard 1992, Rose 2000) is to challenge certain aspects of scientific understanding as incompatible with theological insights. Another (e.g. Nesteruk 2008) is to see scientific understanding as valid but to treat it as having little to say directly to a Christian theological framework. In this second view, much of what has been developed in the so-called science-theology dialogue among Western Christians is seen as irrelevant to Orthodoxy, and even as potentially harmful. The third strategy, reflected in my own work (Knight 2001, 2007), is the one that I shall describe here. It is to see the science-theology dialogue among Western Christians as being potentially helpful to Orthodox Christians, but as being in need of insights from Orthodox theology if its potential is to be fulfilled.

The mainstream science-theology dialogue among Western Christians is based largely on an agenda and approach that were developed in the second half of the twentieth century. Three figures were dominant in this development: Ian Barbour, Arthur Peacocke and John Polkinghorne, whose overlapping understandings have been helpfully compared by two of them (Polkinghorne 1996, Barbour 2012). Three fundamental characteristics may be seen as central to these understandings.

The first is that naturalistic perspectives are seen as valid in understanding the development of the cosmos at both physical and biological levels, and the laws of nature are seen as being always operative. An older Western "God of the gaps" approach - in

which divine action was effectively identified with events that did not seem susceptible to naturalistic explanation – is avoided. God is seen as being active in all events "in, with, and under the laws of nature". This naturalistic focus has, I shall argue, been valid in its intention and in many of its conclusions, but it has not been fully considered from a theological perspective, so that an Orthodox critique and expansion are necessary.

The second and third main characteristics of this mainstream Western approach are, I shall argue, even more in need of an Orthodox critique. One of these is an understanding of both scientific and theological language usage that is usually described as being a form of critical realism. I shall suggest that this understanding - with its focus on ontology - may be questionable for both philosophical and theological reasons. The other characteristic of the mainstream Western approach that requires an Orthodox critique is what is sometimes called its "causal joint" account of divine action. This too, I shall suggest, may be questionable for both philosophical and theological reasons.

## Naturalistic perspectives

It is in relation to God's use of the evolutionary process in His action as creator that naturalistic perspectives are most commonly a cause of disquiet among Orthodox Christians. This disquiet may, I suggest, be lessened or eradicated by taking into account some of the early theological analyses of Darwinism that were made by Western Christians, since these have been taken up within the more recent Western dialogue to enable evolutionary and theological perspectives to be seen as consonant with one another. In particular, the account of the Anglican priest, Aubrey Moore, published in 1889, has been extremely influential. Arguing against the notion of "special creation" - in which the first chapter of *Genesis* is seen as implying that God created the world in a series of supernatural acts - Moore suggested that the Darwinian view is "infinitely more Christian". For, he argued, the Darwinian view may be seen as implying "the immanence of God in nature and the omnipresence of his creative power". Those who oppose the evolutionary understanding, he went on, "in defence of a 'continued intervention' of God seem to have failed to notice that a theory of occasional intervention implies as its correlative a theory of ordinary absence" (Moore, 1889, 184).

This sense of the continuous action of God through natural processes is something that Orthodox Christians can surely affirm, especially when certain patristic perspectives are taken into account. For example, St. Augustine of Hippo not only (like St. Gregory of Nyssa and others) saw the creation of the world as a single act rather than as a series of acts. He also quite specifically speculated about the way in which God may

in the beginning have created potentialities – "seeds" – that would be actualized only at a later time.

It may be true that the patristic authors assumed that natures are fixed. This assumption, which they shared with all their contemporaries, is clearly challenged by the notion of species arising through evolutionary processes. Nevertheless, as Andrew Louth has noted in relation to St. Maximos the Confessor, their thought, with its implicit dynamism, is still "open to the idea of evolution … as a way of expressing God's providence" (Louth 2004, 189), so that it "can be re-thought in terms of modern science" (Louth 2004, 193). Moreover, as Panayiotis Nellas has noted from another perspective, patristic anthropology is not incompatible with evolution. The Fathers, he observes, held that the "essence of man is not found in the matter from which he was created, but in the archetype [the incarnate Logos] on the basis of which he was formed and towards which he tends." It is for this reason, he goes on, that "the theory of evolution does not create a problem … because the archetype is that which organizes, seals and gives shape to matter, and which simultaneously attracts it towards itself (Nellas, 2007, 33). These perspectives point towards the way in which Orthodoxy can accept naturalistic perspectives on evolution in much the same way as has happened within the mainstream Western science-theology dialogue. We should note, however, that to speak as Nellas does is to point towards a far more subtle notion of the character of the "laws of nature" than is to be found in that dialogue. As we shall see, patristic perspectives provide for Orthodox Christians a much richer and more theologically-potent view of naturalistic processes than any to be found in the West.

## Critical Realism

The second characteristic of the mainstream science-theology dialogue in the West that we need to examine is its assumption of "critical realism" in relation to language usage in both science and theology. This term, as it is used within the dialogue, is taken to mean that both science and theology point towards ontological truth, but that this truth is not absolute but only "approximate". This view rests on both a questionable equating of some of the characteristics of theological and scientific language usage, and on an interpretation of scientific progress that relies largely on Karl Popper's notion that scientific progress involves "increasing verisimilitude" in ontological description of the world.

One of the things that has been lacking in the adoption of this understanding within the Western science-theology dialogue has been an adequate acknowledgment of the philosophical problems of this understanding of science. In relation to these, one

commentator has described critical realism as "a majority position whose advocates are so divided as to appear a minority" (Leplin 1984, 1), and this division among them suggests that critical realism requires more detailed examination than it is usually given by the dialogue's participants. I myself (Knight 1995; 2001, 91-105) have argued that that this may be done through the writings of two philosophers of science who point towards a much subtler and less problematical understanding of critical realism than is usually evident.

The first of these philosophers, Mary Hesse, has focused on physics and spoken about what she calls its "structural" (as opposed to ontological) realism. "It is undeniable" she says, "that mathematical structures become ever more unified and universal with every advance in theory; the structural realm of physics is truly progressive. But the substantial description of what the structures relate changes radically from theory to theory" (Hesse 1988, 188). In a comparable way, but looking at the question from a different perspective, Rom Harre has spoken of what he calls "referential" realism. He distinguishes two types of scientific reference, exemplified by the statements "this grey powder is a sample of gallium" and "whatever is the cause of these bubbles is a neutrino". Only the second of these statements, he points out, involves a cognitive act of conceiving and accepting a theoretical account. This does not mean, he argues, that there is not genuine reference in this statement, but it does mean that the physicists' usual assumption - that the neutrino thus referred to is a "particle" – is not an intrinsic part of the act of reference. It is, says Harre, "the conservative metaphysical predilections of physicists that push the ontology that way" (Harre 1986, 101), and he points out that there is an alternative metaphysics available in the understanding developed by the quantum physicist, David Bohm.

The caution in assuming ontological description that is implied as necessary by these arguments is reminiscent of the kind of apophaticism that is characteristic of Orthodox theology. Usually, this apophaticism is understood by Orthodox only in relation to theological language, in terms of the recognition that categories understood only in relation to created things cannot be applied to God. However, in the patristic understanding, apophaticism was sometimes understood more broadly, and for St. Basil the Great, in particular, it was (as Vladimir Lossky notes) "not the divine essence alone but also created essences that could not be expressed in concepts. In contemplating any object we analyse its properties; it is this which enables us to form concepts. But this analysis can in no case exhaust the content of the object of perception. There will always remain an 'irrational residue' which escapes analysis and which cannot be expressed in

concepts, it is the unknowable depth of things, that which constitutes their true, indefinable essence" (Lossky 1957, 33).

A further consideration that may make Orthodox Christians wary of the simplistic critical realism of the Western science-theology dialogue is that most of the dialogue's participants implicitly assume the kind of materialism that denies the validity of any kind of idealism. They tend to ignore the fact that this denial has not always been typical of scientists. They pay no attention, for example, to the early twentieth century astrophysicists James Jeans and Arthur Eddington, who wrote popular books that tended to interpret science in an idealistic spirit, arguing that modern physics seemed to require such an interpretation. This avoidance of idealistic interpretation may perhaps be due to the philosophical criticism of Eddington's and Jeans' s understandings made by L. Susan Stebbing (1937), which made later scientists - even if their instincts were similar to those she attacked - wary of trespassing on philosophical territory. Participants in the Western science-theology dialogue have generally followed these later scientists in this wariness.

The question remains, however, of whether there may remain some validity in the views advocated by Jeans and Eddington, which are reminiscent of the eighteenth century idealism of George Berkeley. One modern religious philosopher, Keith Ward, has pointed out that the common rejection of Berkeley's views is often based, not only on a profound misunderstanding of those views, but also on ignoring the implications of theistic perspectives (Ward 2012). Moreover, in the patristic period, not only can we see something distinctly reminiscent of the Berkeleyan view in the views of St. Gregory of Nyssa (Karamanolis 2013, 101-7). In addition we can see parallels between Gregory's views and the quasi-idealist metaphysics of the quantum physicist, David Bohm (Schooping, 2015).

**Divine Action**

The third pillar of the Western science-theology dialogue that Orthodox Christians need to question is the view of divine action that has been prevalent. This view has been developed on the basis of a distinction that his long been common in Western theology: that between "general" divine action and "special" divine action.

The first of these categories refers to events that come about through the benevolent design of the world. They are seen as coming about simply through the normal operation of the laws of nature. While at one time this was thought about (as it still is by advocates of "intelligent design") in terms of the "design" of each individual part of the cosmos, this older understanding is now commonly expanded so as to allow

for a purely naturalistic understanding of the universe's development. It is the whole cosmos – not each of its parts - that is now generally seen as benevolently designed.

The second of these categories – "special" divine action – refers to events that occur through divine "response" to events in the world, and in this sense it represents interference with the world's usual workings. Within the mainstream Western science-theology dialogue, this is now commonly expressed, not in terms of a notion of "supernatural intervention" that envisages setting aside the laws of nature, but in terms of what is sometimes called a "causal joint" model. In this model, what is envisioned is a kind of divine manipulation of the laws of nature.

An important factor in the development of this causal joint model was the way in which, through the development of quantum mechanics, physics in the early twentieth century moved from a deterministic model of causality to a non-deterministic one, which recognised that only probabilities could be assigned to particular potential outcomes. This seemed too many to allow God to respond to events in the world, not by setting aside the laws of nature, but by changing the probabilities involved in their operation. Some actually saw quantum level indeterminacy as the site of the causal joint that allowed God to do this, while others, like Peacocke and Polkinghorne, looked for alternative sites that could also be spoken of in a scientifically literate way. However, these approaches have been criticized not only by me (Knight 2007, 22-7) but also by Nicholas Saunders, who goes as far as to ask whether it would be correct to argue that, using the causal joint model, "the prospects for supporting anything like the 'traditional understanding' of God's activity in the world are extremely bleak?" He answers this rhetorical question much as I would: "To a large extent the answer to this question must be yes. In fact it is no real exaggeration to say that contemporary theology is in a crisis" (Saunders 2002, 215).

A further critique that is relevant from an Orthodox perspective is that which Wesley Wildman has made. (He refers particularly to the understanding of Robert John Russell, but his argument may also be applied to other advocates of a causal joint model.) This is that the motivation for developing such a model is what Wildman calls "a personalistic theism of a distinctively modern kind … a distinctively Protestant deviation from the mainstream Christian view" (Wildman 2006, 166). For Wildman himself, an understanding of this "mainstream view" is perhaps biased towards traditional Western understandings, but a comparable critique can certainly also be made from an Orthodox perspective. For at the heart of much of the motivation for seeing a causal joint approach as necessary is a view of God's "personhood" that is not only at odds with Orthodoxy's apophatic reluctance to apply to God a notion of personhood derived from experience of

being human persons. It is in conflict also but with an Orthodox understanding of God's relationship to time, which is much closer to traditional Western understandings (as found, for instance, in Aquinas) than it is to the "temporal God" scheme advocated by most defenders of the causal joint model.

## A revived and revised teleology

A way of thinking about divine action that I have proposed (Knight 2007), and which I believe overcomes all these problems, is related to what might be called a revived and revised notion of teleology. What I advocate is not teleology as understood in ancient and medieval philosophy, of the kind rejected in the development of modern science. Rather, what I advocate is something that arises from a convergence between scientific and theological perspectives. There is, in this approach, no conflict with scientific perspectives as such. Rather, the approach I advocate involves a theological interpretation of scientific understandings.

The first such scientific understanding that I have pointed out in this context is the notion of evolutionary convergence. This notion has been popularised by Simon Conway Morris, who in order to explain his position uses the notion of "attractors" in chaos theory. (These are not literal attractors, which exert an influence by some kind of force, but simply outcomes that are probable.) He has explored, in particular, the implications of the way in which certain functional solutions to the problems of species survival in particular ecological niches have often arisen independently through very different evolutionary pathways. On the basis of this, he has speculated that "an exploration of how evolution 'navigates' to particular functional solutions may provide the basis for a more general theory of biology. In essence, this approach posits the existence of something like 'attractors', by which evolutionary trajectories are channelled towards stable nodes of functionality." It is, he goes on, his suspicion "that such a research programme might reveal a deeper fabric in biology in which Darwinian evolution remains central as the agency, but the nodes of occupation are effectively determined from the Big Bang" (Morris 2003, 309-10).

The teleological implications of Morris's approach are obvious provided that teleology is not understood in terms of some pre-ordained "end" that exists over and above anything that science can legitimately postulate, but is understood rather in terms of probable outcomes that arise directly from factors that are understandable scientifically. Comparable implications arise when we come to explore the way in which, as astrophysicists acknowledge, the universe seems to be "finely tuned" for the naturalistic emergence of beings like ourselves. There have, admittedly, been many

ways in which the "anthropic cosmological principle" that arises from this fine tuning may be interpreted (see Barrow and Tippler 1986), and recent discussion has been further complicated by speculation about various kinds of "many universes" theory. Nevertheless, there remains a sense in which, for many, the evident fine tuning of our universe poses questions to which "theism provides a persuasive (but not logically coercive) answer" (Polkinghorne 1991, 80), and even if this persuasiveness is perhaps less marked than some believe, the fine tuning that is observable is certainly consonant with a teleological understanding of the kind that I advocate.

Such considerations suggest that we can speak about a universe which at one level – the scientific - "makes itself" naturalistically, but which at a deeper, theological level may be seen as having a pre-programmed "goal": the emergence of beings who can come to know their divine creator. This understanding may, at first sight, seem deistic, but I have argued that this will not be the case in any theological framework that is panentheistic - i.e. in which God is understood as being in everything and everything as being in God - since in such an understanding God can never be the "absentee landlord" of deistic belief. In particular, I have argued that a panentheistic understanding is intrinsic to Orthodox theology because of its way of using the fourth gospel's notion of the divine *Logos* [Word] (John 1: 1-4).

This notion of the divine *Logos* has historical roots both in Greek philosophy and in the concept of Wisdom set out in *Proverbs* 8. For Orthodox Christians, it has implications in terms of what St. Maximos the Confessor called the *logoi* of created things and the *logoi* of prophetic utterance, both of which he sees as being, in some sense, manifestations of the divine *Logos*. The linking of these *logoi* and the divine *Logos* indicates that Maximos envisaged what has been called "almost a gradual incarnation" (Thunberg 1985, 75). In this understanding, the incarnation in Christ is not a supernatural intrusion into the created order so much as a process that has its beginning in the act of creation itself.

The teleological aspect of this understanding is brought out in many commentaries on Maximos. For example, Kallistos Ware, Bishop of Diokleia, has observed that for Maximos "Christ the creator Logos has implanted in every thing a characteristic logos, a 'thought' or 'word' which is God's intention for that thing, its inner essence which makes it distinctively itself and at the same time draws it towards the divine realm." (Ware 2004, 160). In a comparable way, Vladimir Lossky has commented that for Orthodox theology, - with its concept of *logoi* (which he translates as "thought-wills") - the world, "created in order that it might be deified, is dynamic, tending always towards its final end, predestined in the 'thought-wills'" (Lossky, 1957, 101). These comments reflect the

notion that we have already noted in relation to Panayiotis Nellas' analysis of patristic thought. This is that the divine Logos is not only that which is incarnate in Christ, but is also "that which organizes, seals and gives shape to matter, and which simultaneously attracts it towards itself" (Nellas, 2007, 33). Thus there is, in the Orthodox theology of creation, what I have called a "teleological-christological" understanding (Knight 2007, 113-24)

Related to this understanding are two other factors that set the Orthodox theology of creation apart from most Western understandings. One is that for Orthodox theology there is no separation of grace and nature of the kind that medieval Western theology saw as almost axiomatic. As Lossky has put it, the Eastern tradition "knows nothing of 'pure nature' to which grace is added as a supernatural gift. For it, there is no natural or 'normal' state, since grace is implied by the act of creation itself" (Lossky 1957, 101). The other is that Orthodox theology is, as I have noted, panentheistic, in the sense that God is seen as being in everything and everything is seen as being in God. This is evident not only from the way in which St. Maximos speaks about the *logoi* of created things (Louth 2004) but also from the way in which St. Gregory Palamas speaks about the divine energies (Ware 2004). When these factors are taken into account, it becomes clear that Orthodox theology sees divine action, not as occurring from "outside" of the cosmos in the way that is implicit is in both the medieval Western notion of supernatural intervention and in the more modern Western causal joint approach. Rather, for Orthodoxy, divine action is intrinsic to the very nature of the cosmos.

## The miraculous

At first sight, it may seem that those events that we refer to as miraculous cannot be fitted into this teleological-christological understanding. However, three factors indicate that this first impression may be mistaken.

The first of these factors is that when Orthodox authors use the term *hyper physis* – meaning literally "above nature" but usually translated as *supernatural* – what they envisage is something subtly different to what Western authors usually mean when they speak of supernatural events. Because, for Orthodoxy, there is no "pure nature" to which grace is added as a supernatural gift, events that are "above nature" are not seen as supernatural in the technical Western sense. In certain respects, the term *hyper physis* might be better translated as *paranormal*.

The second factor to be taken into account is that patristic perspectives occasionally point towards an understanding of miracles, not in terms of natural laws being set aside, but in terms of what we might call "higher laws of nature" becoming

operative. (This has particularly been commented on in relation to St. Augustine of Hippo.) An interesting point here is that this kind of understanding manifests evident parallels with a trend in the Western science-theology dialogue, which has led some to speak of miracles as analogous to regime change in the natural world (Polkinghorne 1986, 74), and others to speak of an "instantiation of a new law of nature" (Russell 2002). This kind of understanding, I have argued, enables us to articulate a kind of "enhanced naturalism" within which the possibility of the miraculous may be affirmed.

The third factor to be taken into account is, however, perhaps the most important. This is that Orthodox theology has a strong eschatological sense, so that it perceives two transformations in the created order. The first of these transformations is associated with biblical notion of the "fall" - the expulsion from Eden. (This is not always seen by the church Fathers as a historical event but instead – especially for those in the Origenist tradition – as in some sense meta-historical.) The second transformation is the coming eschatological transformation, in which the "world to come" will be experienced in its fullness. In the patristic expression of it, this understanding - that the present state of the world lies between two other states - is often articulated in terms of the "garments of skin" given to the humans expelled from Eden (*Genesis* 3:2), These are taken to refer to "the entire postlapsarian psychosomatic clothing of the human person" (Nellas 1997, 50 [note.92]). These garments of skin (and their cosmic accompaniments) are not seen as "natural", in the sense of what God originally intended or ultimately intends. Rather, the world as we now usually experience it is seen as being in some sense sub-natural (Nellas 1997, 44; Knight 2008).

In terms of this understanding, what we perceive as miraculous may be seen as an anticipation of our restoration to a "natural" state from our present "subnatural" one. This sense of our experience sometimes being of this restorative kind has been most explicitly explored, perhaps, in terms of the sacramental mysteries (e.g. Sherrard 1964), but it is often implicit in Orthodox commentary on miracles as well. In terms of this understanding we can, for example, see with a new clarity how the eschatalogical state in which "the wolf shall lie down with the lamb, the leopard shall lie down with the kid" (*Is*.11:6) is anticipated in the stories of "miraculous" friendship between wild animals and saints such as St. Francis of Assisi, St. Seraphim of Sarov, and St. Cuthbert of Lindisfarne.

What I have implicitly suggested in my book, *The God of Nature* (Knight 2007), and will more explicitly set out in a book in preparation, is that we can develop a coherent approach to divine action – including divine action in those events we see as "above

nature" - by using a three-pronged approach rooted in the suggestions I have made here. This approach involves

(i) a teleological interpretation of scientific insights of the kind I have outlined;
(ii) a scientifically-rooted "enhanced" naturalism of the kind I have noted as characteristic of at least some patristic and modern thinking; and
(iii) expansion of what has often been called St. Maximos the Confessor's "cosmic vision".

Despite its deep roots in Orthodoxy, this approach will not only be relevant to Orthodox Christians. Already, in Western Christian theology, there are indications of a growing disillusionment with much of the traditional Western notion of God's relationship to the world, and there have been a number of recent attempts to develop a panentheistic understanding comparable to that of the Orthodox approach (see e.g. the essays in Clayton and Peacocke 2004). Moreover, in a study by Denis Edwards (2010), there has been an attempt to understand divine action that, while rooted in the Western scholastic conception of primary and secondary causation, manifests – like my own approach - a transcendence of the old Western distinction between general and special modes of divine action. It seems at least possible, therefore, that Western and Eastern understandings might be beginning to converge.

## Tradition

To end this reflection, I shall simply note that there may be those in the Orthodox world who – in the name of "Tradition" – will be wary of the openness of my proposed approach to modern scientific understandings and to Western Christian reflections. To such people I would simply urge that the notion of Tradition, while conveying the need to recognize and venerate what we have inherited from the past, is at its best always forward-looking and able to receive valid new insights, whatever their origin may be. As Metropolitan Kallistos (Ware) of Diokleia has put it, "Loyalty to Tradition, properly understood, is not something mechanical, a passive and automatic process of transmitting the accepted wisdom of an era in the distant past. An Orthodox thinker must see Tradition from within, he must enter into its inner spirit, he must re-experience the meaning of Tradition in a manner that is exploratory, courageous, and full of imaginative creativity … The Orthodox concept of Tradition is not static but dynamic, not a dead acceptance of the past but a living discovery of the Holy Spirit in the present. Tradition, while inwardly changeless … is constantly assuming new forms, which supplement the old without superceding them" (Ware 1993, 198).

Metropolitan Kallistos makes comments, too, on the role of Western Christian insights in this process. If we Orthodox "are to fulfil our role properly" he says, "we must understand our own Tradition better than we have in the past, and it is the west … that can help us do this. We Orthodox must thank our younger brothers, for through contact with Christians of the west we are being enabled to acquire a new vision of Orthodoxy." (Ware 1993, 326).

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# THE DIALOGUE BETWEEN THEOLOGY AND SCIENCE: FROM A NEO-PATRISTIC LEGACY TO RADICAL THEOLOGICAL COMMITMENT

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## "Theological commitment" in the dialogue between theology and science

Research related to the dialogue between theology and science became a matter of intensive scholarly discussions in the last 20-30 years. It is then natural to pose a question: has this dialogue, in that form as it has been conducted, succeeded so far, that is, did it achieve any results which had impact on both science and theology? The author believes that the negative answer is provided by the unceasing scientific and technological advance (in particular in the exact natural sciences) which continues with no recourse to the dialogue between theology and science whatsoever. All discussions on whether science and theology are in conflict, or in "peaceful coexistence" with each other, do not have existential implications: the problem remains and its ongoing presence points to something which is basic and unavoidable in the very human condition. This net result indicates that the method of conducting this dialogue at present is unsatisfactory in the sense that it does not address the major question as to what is the underlying foundation in the very *distinction, difference and division* between science and religion as those modes of activity and knowledge which flourish from one and the same human subjectivity. But this type of questioning makes any scientific insight irrelevant simply because science is not capable of dealing with the question of its own facticity, that is the facticity of that consciousness which is the "pillar and ground" of science. Theology can respond to this question from within the explicitly belief-based ground, namely faith in that the knowledge of the world represents natural revelation accessible to humanity because of the God-given faculties. Knowledge is possible only by human persons whose basic qualities are freedom and capacity to

retain transcendence with respect to all they assimilate through life and knowledge. In this sense the universe as articulated reality has existence and sense only in a mode of personhood, which is a divine gift. Since science does not account for the very possibility of knowledge, that is personhood, it is automatically prevented from participation in the dialogue with theology on equal footing. It is logical then to express a doubt on the meaning and value of such an existing "dialogue" with science at all. If one insists on this "dialogue" it becomes obvious that science and theology cannot enter this dialogue as symmetric terms. And if there is no impact of this "dialogue" on logic and development of science, what remains for theology is to exercise an introspection upon science, to conduct a certain *critique* of science from a position which is beyond not only scientific thinking, but secular thinking in general related to particular socio-historical and economic realities. Thus symmetry between theology and science is broken from the very inception. It is this asymmetry that constitutes that approach to the science-religion discussions which we describe in terms of *theological commitment*. Theological commitment is such a stance on human being which always positions it above and beyond those realities which are disclosed by science alone. It appeals to those meanings of existence which do not compel the recognition of the science in the manner that natural phenomena do. These meanings originate in an innate quality of human beings to long for immortality that is communion with the unconditional personal ground of the whole world, which humanity names God. And it is through this longing that the universe acquires a certain sense as that constituent of God's creation which makes it possible for human persons to fulfil God's promise for eternal life and communion. Theological commitment is thus existential commitment.[1]

Another aspect of theological commitment in the dialogue is the reaction to modern atheism.[2] Indeed, in its goals and tasks the dialogue between Christianity and science is

[1] On an Orthodox Christian appropriation of existentialism see (Puhalo 2001, pp. 48-59).

[2] Atheism constitutes an indispensible aspect of modern social reality in that part of the human community, which is associated with the cumulative symbol of the "West". To be more precise, atheism enters the definitional characteristic of the West together with such terms as secularism and nihilism. All together these terms aim to imply that all aspects of the traditional Christian life, its values and ideas become practically non-observable and carefully hidden under the surface of the politically correct ideologies. Any talk about belonging to Christianity is encouraged only on the level of private life, so that Christian values are not taught and explained in public schools and universities. One means here not only the lack of systematic theological education (not Religious Studies) in schools, but a complete hostility and suspicion with respect to anything religious, and hence fideistic in some academic circles (both in the West and the East). While the militant scientific atheism is no more in place in the traditionally Orthodox countries as being ideologically discredited in the recent part, what replaces it is its transformed and socially adjusted remnant, a relict tail of the atheistic form of consciousness, which can be labelled as secularism. Atheism also means a certain stance on the nature of reality and its knowability. Orthodox theology asserts that *reality*, understood in a wide theological sense, is much wider than that which is known to human beings through scientific research. If the human reason is subjected to this lure of all-embracing knowledge, and disregards the human spiritual experience of contemplating realities which are beyond the visible and intellectual, it inevitably arrives at the idol of scientific progress which can only know this reality outwardly, and manipulate it technologically: "We have become so accustomed to the scientific-technological stance

to oppose atheism.[3] However, if one carefully looks at how this dialogue has been conducted so far, one easily realises that the existing forms of this dialogue are adapted to that which is imposed by atheism. Contemporary atheism manifests itself not only as freedom from historical authorities and tradition (that is the liberation from freedom in a Christian sense) and not only as the unprincipled following of the proclamation "enjoy life for there is no God", that is not only as the worst form of the unenlightened slavery of the Plato's cave in which the signs of the Divine presence are not recognised and the very ability to see them in the world is reduced to nothing. Atheism promotes a cult of immanence, the actually existent infinity of the given[4], appealing *de facto* to deprivation of the senses and the vision of the transcendent (and hence to the relaxation of a soteriological moment). Since modern science, and technology in particular, encourage individuals to be transcendent-blind, creating the immanent images of the transcendent, the advocates of atheism appeal to science. By so doing atheism adjusts to the demands and moods of modern time. It is much easier not to deny the presence of the Divine in the world, but to claim that all spheres of the human activity are self-sufficient and do not need any reference to God. Since from a philosophical point of view the question of God's existence or nonexistence cannot be decided (the philosophical mind remains in the "negative certitude" with respect to this question), then why should one try to answer it. Would it not be easier to recognise that science, art, literature etc. are just given in rubrics of that which is *unconcealed* to humanity. Here atheism reveals itself as secularism, as a kind of trans-ideological *läicité*, as a servility to nobody's interests, and as a servility to the alleged ideal of humanity understood only empirically, as that humanity which is alive here and now[5] (it is supposed that this ideal of humanity has in itself a universal criterion of its own definition). To define this humanity in simple categories which overcome racial national and class differences one needs a universal language. It is science which pretends to be such a language; to be more precise, it is that scientific form of thinking which reduces the phenomenon of humanity in all its various manifestations to the physical and biological. It is clear from here that modern atheism as a certain form of the "immanent humanism" is no more than a *scientific*

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that we have lost the faculty of addressing reality as a whole, of seeing in it the source and sustainer of life, of responding to it with reverence and receptivity, and of surrendering ourselves to it in all fulfilling love. We have lost the capacity to respond with our whole being to the being of the Wholly Other who presents himself to us through the created universe" (Gregorios 1987, p. 91).

[3] See more details in (Nesteruk 2013, pp. 1-19).

[4] See a more elaborate formulation of a mysticism of immanence, for example, in (Comte-Sponville 2006, pp. 145-212).

[5] As was argued by G. Goutner, the alleged ideal of humanity, understood, for example as it unity, simply does not exist. One can think of it only in a modality of hope which has a religious nature (see (Goutner 2013, pp. 230-36)).

*atheism*. However this atheism positions itself as more aggressive[6] and sinister, more advanced philosophically and anti-theologically[7] than was the case, for example, in the Soviet Russia. The reason for this is that modern atheism is ultimately motivated by the logic of material production and human resources, that is by the needs of the developing economies and not an abstract ideology.[8]

The freedom from traditional and philosophical authorities as well as historical values inverts in modern atheism towards slavery to the scientifically articulated and verified. It is paradoxical, and fundamentally different from the former Soviet model of atheism, that a slogan that "knowledge is power" is not appreciated in the economically advanced societies, for the all-encompassing knowledge, that is knowing too much, is potentially socially dangerous. This entails in turn that knowledge and science both function in society in a reduced and popular form which does not allow one to judge of its certitude, quality and completeness. Scientific knowledge becomes a world-outlook, ideology and a filter of the social loyalty and adequacy. As a result the abuse of science becomes a norm which creates an illusion of its efficiency and truth in all spheres of life. The scientific method is treated as self-sufficient and not being in need of any justification and evaluation. Science proclaims the truth of the world from its own rationality which functions in the disincarnate collective consciousness. Supported through the system of grants from the economically powerful groups, it is allegedly done for the sake of human good. However by functioning in society science forgets about that simple truth that science is the human creation and its initial meaning was to guard the interests of people and not to make them slaves and hostages of the scientific method.

The situation with the dominance of the scientific approach to all aspects of life becomes even more paradoxical when one realises that human beings do not become more happy and free from the aspects of material existence. They cannot escape social injustice, hardship of mundane life, diseases and moral losses. This happens because science as an ideology does not spell out what is most important, namely that it *does not know the goals and ways of its future development*. In its grandeur science has to intentionally disregard those aspects of reality which are not described by it or which behave sporadically and unpredictably with respect to scientific prognosis. Economic growth and welfare of the developed nations which used to live in comfortable

[6] See examples of this in (Dawkins 2007), and (Stenger 2008).
[7] See, for example, (Comte-Sponville, 2006).
[8] This point was emphatically defended by C. Yannaras in his article "The Church in Post-Communist Europe" (Yannaras 2011, pp. 123-43). Yannaras gives a concise formulation of the consequences of such an ideology as it relates to existential dimensions of human persons: "Metaphysics, art, love, morality, are pushed to the margin of human life, as mere complements of "entertainment" or of psychological preferences, as an inactive "superstructure" on economic priorities that have been rendered absolute…".

conditions, the cult of consumption and greed demand more technological development related to the exploitation of the natural resources. Every new discovery in physics is employed for the optimisation of the production of goods and energy, so that one can speak about merciless exploitation of the physical reality in general. It is very seldom that the question of the legitimacy and justification of such an exploitation, or, as some say, "rape of nature"[9] is even thought of. By making nature an object of manipulation scientific consciousness forgets of its humanitarian duties in respect to nature: nature must be "respected" simply because we live in it and that there is the light of that all-embracing reason (Logos) which we, human beings, carry in ourselves as little *logoi*. The objects of nature are inseparable from their creator, so that the oblivion of this fact leads to the loss of love of them in the same sense as the loss of love to other people. A careful insight of a philosopher or a theologian will unmistakenly identify the root of the problem, namely that the atomisation, and disassemblement of the physical reality in course of its exploitation has it origin in the ethical individualism of those who know this reality, that is the loss of love to nature in the scientific community. The individualism consists in that the exploration and acquisition of physical reality becomes an affair of that human spirit which is divided in its narrow professional and corporative interests in which the element of catholicity with nature through the divine-given existence, is forgotten because love does not rule anymore for the interest of knowledge and longing for the perpetual good.

The ambitions of the immanent secular reason, supported by the scientific achievements seem to be even stranger if one realises that modern science, in spite of its successes manifests the symptoms of a deep crisis related to the uncertainty of its goals. Scientific activity is purposive to the extent which accompanies any human activity. Any particular research has a concrete objective either to satisfy a practical interest or simply curiosity. However when we speak of the uncertainty of goals of science in general, we mean something different: scientific quest is spontaneous and is not related to the spiritual, infinite tasks of humanity. The practical purposiveness of scientific research thus unfolds only a particular sector of nature so that there remains a gap between that which has been known through a scientific phenomenalisation and that which cannot be known by science at all. This fact manifests that nature has a propensity to remain *concealed* and react with respect to human experiments unpredictably. As an example, one can point to nuclear physics which, by acquiring the

[9] This was the title of Ph. Sherrard's book *The Rape of Man and Nature: An Enquiry into the Origins and Consequences of Modern Science* (Sherrard 1991), where he aggressively criticized modern science for the exaggeration of the sphere of applicability of its methods and resulting dehumanization of humanity and desanctification of nature.

mysteries of the microworld risks to create a state of matter which can threaten human existence on this planet.[10] There is a danger in nuclear experiments of trespassing the boundary of the unconcealed, related to human existence, when constructed devices and artificial states of matter may behave in a non-human way, contradicting the initial objectives of experiments and turning science against humanity. A simple example from philosophical discussions of the 1950s is the atomic bomb which brought humanity to a new situation when the conditions of its existence are not controlled anymore only by the natural processes, but depend on the good will of people making decisions of using or not nuclear weapons, thus influencing global natural processes.[11] Another example is the ecological crisis. The melting polar cup of Greenland, extinction of some animal species and forthcoming migration of peoples living in the Arctic region show that technological applications of science escaping *moral reason* lead to problem of the social and political order. Science through technology is not neutral anymore to economics and politics and, on the contrary, becomes their result and prophet. The process of exploration and knowledge of the surrounding world and thus its "transformation" becomes involved into the sphere of interests of the world's powers and classes so that its ethical significance is determined by its belonging to this or that social-economic demand. That which has been said entails that scientific knowledge and the very idea that society can and must develop only on the basis of scientific progress becomes an ideological dogma, the following and defending of which in turn becomes a matter of social loyalty. However, without understanding its logic and definite goals, scientific progress, being *de facto* unavoidable and irreversible, carries in itself a potential danger because of the unpredictable nature of it applications. Human beings want to live better and longer; however this natural desire does not supply a clear understanding of the goals of science, whereas humanity becomes more and more dependent on its achievements and applications.

The fact that scientific advance leaves huge realms of being unexplored and unknown becomes even more evident in theoretical sciences, in particular in cosmology. On the one hand cosmology provides us with a comprehensive theory of the universe supported by observations. On the other hand it has to admit that those forms of matter in the universe which are physically understood constitute only 4% of its material content (the remaining 96% associated with the so called dark mass and dark energy

[10] For futurological accounts based on the threats originating in modern science see books of (Leslie1996), (Rees 2003).

[11] N. A. Berdyaev prophetically argued in the 1930s that humanity enters a new era when the stability of the world will depend on moral decisions of humanity of how to use technology available through scientific advance. See (Berdyaev 1991).

remain by now beyond the reach of experiments; their existence is a matter of theoretical conviction). The more cosmology refines its scenario of the universe's evolution, the more it realises the abyss of the physically unknown. Speaking philosophically, cosmology makes clearly seen the boundaries of the *unconcealed* which is related to humanity: it is only 4% of mater in the universe which can be said to be consubstantial to human physical and biological form. Amazingly, however, that in spite of all evidence for the limited nature of our knowledge of the universe, cosmologists sometimes position themselves as "prophets and priests" of the universe, preaching of it as if they know the absolute truth of the world.

One of the major attributes of modern science which makes it powerful is its radical mathematization of nature. Physics and cosmology, through mathematical models and theories, predicate realities inaccessible in direct experiments. There is a paradoxical shift of representations of reality here: unobservable intelligible entities are treated as more fundamental and responsible for the contingent display of visible nature. As we argued elsewhere mathematisation of nature is accompanied by the diminution of humanity, in particular the personal dimension of existence.[12] Person disappears from scientific discourse in spite of the fact that all articulated facts are made by persons. Science is being effected in the name of human persons, but this same person turns out to be outside of scientific description. Persons are needed for the anonymous objectives of science to disclose reality, but they do not exist for science as agencies of other non-scientific truths and individual lives. Science as a social process needs scientific workers but not persons as unique and unrepeatable events of disclosure of the universe. The same is true with respect to society which needs not persons but masses of individuals which are much easier adapted to the norms of materialistic thinking and behaviourist stereotypes based in the criteria of consumption of the results of technological progress. Modern atheism exploits this aspect of modern science by insisting on effective non-existence of personhood as a philosophical and theological notion. The oblivion of the person is treated by Christian theology as an encroachment on the absolute priority of the human world and those communal links in human societies which have formed the spirit of the Christian civilisation and integrity of its historical paths through communion with God. The oblivion of the person is the encroachment on the historical significance of its history impressed in the architectural image of European cities, masterpieces of art and literature, in the very way of European thinking and its values. The oblivion of the person constitutes an attack on all traditional forms of societies and life, which by the logic of the economical must cease to exist or become unobservable.

[12] See (Nesteruk 2008, pp. 188-205).

To defend the person and to reinstate it to its central status in the dialogue between theology and science becomes a leading motive of the theological commitment. To reinstate the person means to understand that the problem of theology and science manifests the basic distinction and division of two attitudes to life in one and the same human person. The dialogue between theology and science becomes the explication the split between intentionalities which the human spirit attempts to reconcile. This, by using the language of Husserl, forms one of the infinite tasks of the human spirit to understand the meaning of existence. The very fact that this dialogue exists attests that human beings transcend the conditions of their physic-biological existence, the self-realisation of a special place in the universe in which the function of the Divine image in man is realised. [13] Thus the fact of the dialogue attests also to that it contains the elements of transcendence and asymmetry between theology and science related to the human condition which is called personhood. It is this asymmetry, articulated in reflection, which we call the theological commitment, by confirming once again that this is an existential commitment. Correspondingly it seems doubtful that the dialogue between Christian theology and science is possible without faith that both theology and science represent modalities of the relationship between humanity and the Divine. Thus the dialogue ultimately contributes to growth of faith in God, to that infinite task which aims to restore the salvific Divine image in man.

## Theological commitment in the restoration of personhood

Science and technology make human life dependent on its own advance while having no power of foreseeing its outcomes. On the one hand a world dominated by technology tends to increase the sense of alternative futures which are available to humanity, on the other hand it tends to decrease our sense of control over this technological future and our ability to outline humanity's infinite tasks independently of technological necessities. It was claimed that technology is going out of control so that the vision of the future in a technological age is vague and often depicted grey and sorrowful. Eschatology is present in this uncertain future as a dooms-day intuition. But this intuition reflects not so much the problems of the technology as such but rather the problems of moral self-involved in advancing the appropriation of the world through technology. For some advocates of Christian ethics this observation was sufficient in order to reject technology for the sake of preservation of Christian values; the naivety of this rejection is obvious since technology permeates all layers of contemporary human

[13] (Berdyaev 1944, p. 94).

society, including the Christians.[14] The abandonment of technology is inconceivable and utopian. However, technology is capable of making its devoted adherents "transcendent-vision-blind"[15] in the sense that it **diminishes** human ability to be attentive to those unusual experiences which cannot be presented in the phenomenality of objects and hence explained or imitated through scientific methods and technology.[16] Paradoxically, technology as such represents a kind of transcendence of the originally natural things, but this transcendence of artefacts and this is why it seems even more paradoxical that one type of a spiritual activity, that is transcendence from the natural, realized in technology, modifies human spiritual and corporeal life to such an extent that it stops not only genuine communion with original nature, but also stops another transcendence towards the non-worldly.[17]

However it is because of the dominance of the scientific in collective consciousness that the secularism affects societies in their entirety, including those ones which are considered as deeply traditional in a religious sense. The lack of the spiritually tantalizing identity of people leads to the fallacy of liberalism as a movement against everyone and everything which is traditional and historically persistent, capable potentially undermine the cohesion of society, its stability and hence happiness and

[14] The negative attitude to technology can be traced back to a much deeper problem of Christianity and culture which has been in existence since the very emergence of Christianity in midst of the Hellenistic world. The historical lessons must be learned of how that ancient culture experienced the creative transformation under the pressure of the sword of the Spirit dissected this culture. For Christians, with all their suspicion and intrinsic hostility to the pagan culture of their time, it was a real challenge to exercise plasticity in order not to lapse to pre-historical state, but to re-shape and transfigure "the cultural fabric in a new spirit" (see (Florovsky 1974, p. 25)). This is the reason why, by analogy, one can conjecture that in order not to lapse to the pre-technological utopian apology Christianity must exercise a similar plasticity in reshaping and transfiguring the modern scientific and technological culture in a similar spirit, that one which was used for the Christian critique and appropriation of Hellenism.

[15] This is an expression from (Gregorios 1987, p. 100) (see also (Gregorios 1988, p. 225)). He qualified this fact with the lack of deepening our roots in the spiritual pole of our existence by more perceptive participation in the Community of the Spirit instead of strengthening the civilisation pole of our existence which diminishes and distorts that Community which lays in the foundations of all other realities (Gregorios 1988, pp. 225-26.) M. Heidegger long back in his "Letter on Humanism" expressed a similar thought about the lack of ability to transcend: "How can the human being at the present stage of the world history ask at all seriously and rigorously whether the god nears or withdraws, when he has above all neglected to think into the dimension in which alone that question can be asked? But this is the dimension of the holy, which indeed remains closed as a dimension if the open region of being is not cleared and its clearing is near to humans" (Heidegger 1998, p. 267).

[16] P. M. Gregorios comments in this context "Science is not as objective a system of knowledge as we once thought it was. It is an *option* that we have chosen and which has given birth to the impressive reality of Western scientific-technological, urban-industrial civilization. *We are part of that system: it is our creation.* We have chosen to limit our perception to the scientifically explicable, and despite the challenge of many phenomena which could have told us that there is something fundamentally wrong with the system we have gone ahead, hoping that all mysteries can be reduced to problems and puzzles soluble by intelligent conceptual investigation" (Gregorios 1987, p. 100 (emphasis added)).

[17] As was expressed by R. Ingarden, "In transcending natural things [the products of human culture] lose the fullness and autonomy of existence, and do not have the force of a reality independent of man and his spiritual acts. These cultural products can gratify man's aspirations to a life elevated above nature only under the condition of his extraordinary spiritual activeness, and they fall back into total oblivion as soon as man looses the will to transcend his simple, inborn nature, and surrenders the creative activeness of his consciousness" (Ingarden 1983, p. 19).

prosperity in a limited period of time.

It is not difficult to realize that beneath all these qualifications one can detect the allegation against atheism, namely its intrinsic inhumanity that is an attack on humanity's essence defined in terms of personhood and the Divine image. Then one can see as how the logic of this diminution of persons receives it further reifications in socio-cultural realities. Since the ideology of historical materialism imposes the demand for "globalization" and hence "multiculturalism" as a disguised form of the international economic slavery, one naturally faces the question of the possibility of the traditionally orientated ethnical and religious communities. Within the logic of the latter all such formations must become obsolete since they hinder the growth of economy. For those who critically approach this stance on the abolition of the many centuries traditions and styles of life the question remains: "Where is the place of tradition, religion, religious communities and ultimately of the Church in all this?" One can press further and ask about the place of a critical function of theological and ecclesial thinking. Are all of them irrelevant?

According to this view all "religious traditions" fall under rubrics of collective identities and thus are fictional and prone to nationalism. [18] However, what is forgotten here is the historical meaning of collective identity related to religiosity. A simple example is that the religious identity the European Christian nations formed cultural monuments and civilizational delimiters of that which modern generations of the Europeans take for granted. It is also forgotten that the very technological advance and scientific appropriation of the world became possible because of the once initiated support of education and research in Western Europe by the Catholic Church. In addition, one must raise a purely philosophical argument that any supposed all-unity of people, as the unity of mankind remains no more than an eschatological ideal, not achievable in the present age.[19] This implies that any aspiration to such an ideal presupposes a hidden tendency towards the faster end of the world. Thus the appeal to non-communal, non-cultural and non-religious identity remains as such an abstract idea devoid of any existential meaning. The case of the countries of the Orthodox civilization resisting the postmodern social trends give a limited support to this conclusion.

Thus here is the fundamental question that Christians should ask themselves "Why is the Church and its theology as its experience?" Christians can respond to this only in one possible way: *Church and its experience represent humanity's deepest need to attain immortality*, that is to achieve the state of freedom from all necessities of this world

[18] (Llosa 2011, p. 117).
[19] See (Goutner 2013).

(related to the conditions after the Fall). Immortality must not be understood in a physical and biological sense, for even physics makes it clear that the present state of the universe will not last forever and our physical survival is doomed. To attain immortality means to have an awareness of death as a part of the biological condition. This is not a trivial statement in the midst of the social reality which lives in the denial of death. One implies here not simply a physical death because of accidents, violence, terrorism, starvation and injustice. One speaks of death at the ontological, cosmic level, for example as scientific understanding that the existence of whole planet is contingently dependent on the *interruption in death* in the whole universe after the Fall.[20] We are lucky of living at that cosmological era which supports biological life (anthropic principle). We are surrounded by the hostile stellar winds, threatening comets and asteroids, instabilities in the moon dynamics which is pivotal for the stability of the earth's axis of rotation, etc. We are contingent upon billions of years of not well understood evolution of the universe which can hardly to be made a home for man. Ultimately, we are lucky of a very short living in the universe when communion with God can be achieved at all. We are *freaks* of the universe (Eric Fromm) living in the conditions of *non-attunment* to it (Jean Francois Lyotard) and inherent physical incommensurability with it. We are living in the universe which is "enframed" through scientific modelling and computational synthesis thus accelerating our "*planetary (cosmic) homelessness*" (Martin Heidegger). All this, being reflected upon theologically, tells us that we do not have too much time in order to fulfil our divine destiny.

Science teaches us of physical and biological laws which demonstrate how vulnerable we are in our physical and biological appearance. We can exist in a very narrow strip of the physical conditions matching the biological ones. We are mortal in the physical universe, because we are ontologically finite. And it is because of this biological and physical finitude that, we, being endowed with rationality (*logos*) and remaining in the universe, crave for immortality and commensurability with the infinite. But this infinite is not in the universe as we see and understand it. This infinity proceeds from us who were born into the conditions of finitude by the power of the invisible but infinite origin. We always struggle with the mystery of our birth, we always unfold the mystery of being in the perspective of understanding of ourselves. Human beings crave for immortality in the mortal universe because they have a gift of *logos* which relates them to *aletheia* that is to truth. And it is this Greek *logos* as truly existent reveals to human beings not the *uninterpreted* necessity which governs the universe, but discloses

[20] Here we use the terminology from the novel *Intermitências da morte* by a Nobel Prize winner in literature Jose Saramago (see English translation (Saramago 2009)).

the truth of existence of God in the mode of *love*, for love itself is the most supreme principle of creation, preceding and exceeding creation itself. Thus the need to attain immortality is the need to find the love of that Who can ultimately be called the Father of "all that was in all".

But science and technological culture, in spite of ingenious techniques of curing human bodies (that is to love them), teaches us as to how to destroy them with an incredible efficiency. By so doing it manifests not only our intelligent supremacy over nature, it demonstrates our intrinsic insignificance as natural creatures. Science teaches us about our temporary and contingent nature, it teaches us and warns us that we are nearly outdated. It is through this that science, in its apophatic stance on humanity, is doomed to direct our attention to immortality as a radical alternative to mortality based on the physical condition. It directs us to the biblical alternative "though shall not kill" because we are nearly and already killed by the nature's response to our actions. In this sense the question of the dialogue between science and religion (theology) is fundamentally incomplete: one speaks of the radical transcending of everything which science asserts on our mortality and our uncritical attitude to death. The question is not of reconciling scientific culture with theology, but of using the latter in order to affirm with a stronger force that theology aims at something other, the otherness of transience and mortality, temporal decay and corruption of bodies and the world's order.

Taken in this historically contingent incarnation science and technology demonstrate us that the good creation of the good God, still being contingent and open to different attitudes, if is approached on the grounds of exploitation does not respond to humanity in that God-given fashion which it expects from us. The manifesting excess of death in the world can only be balanced by the Eucharistic action when the world as such is seen as a sacrament and an opportunity of transition to immortality. Here we come back to ecclesiology as reality of the Church, as that reality which attempts to fight mortality of bodies and souls by commemorating that ecclesial event in which the possibility of immortality as an ontological option was revealed to humanity. Correspondingly through this Eucharistic ethos the vision of the cosmic reality in the perspective of immortality can be transfigured.

Thus the Church and its theology is for those who understand that all ephemerial, intrinsically limited and damaged phenomenality of social reality based on "enframig" by science, political and religious ideologies, as well as by social dogmas, derange their longing for immortality, distort the sense of life and death, deny any meaning in questions about the world, deny existential uniqueness of persons and the value of beauty in communion with the universe. The Church and it theology is for that "yeast" of

people[21] who do not accept nihilism. The wisdom of the Church is for all those for whom the humanity of humans, the naturalness of nature, the justice of the polis, and the truth of knowledge remain absolute values.

## Theological Critique and Neo-Patristic Synthesis

The wisdom of the Church demands to turn to what is called *tradition*. The tradition of the Church is often called Apostolic and Patristic. However what makes the historical position of those who lives in the 21st century similar to that of the Fathers of the Church is that we live in the same historical reality, that is, after Christ, in which the Fathers lived and proclaimed their message about Christ. It is in this sense that our age can still be considered as the age of the Fathers and an appeal to the tradition as the guide line for modern theological development means effectively the appeal to a new Patristic synthesis, the synthesis of our own age[22]. Such a "Neo-Patristic Synthesis" was advocated by one of the leading Orthodox theologians in the 20th century Fr. Georges Florovsky[23] and aimed to rearticulate the fact that the Greek Patristic contribution is important for the catholicity of faith and existential implications not only in the Orthodox context, but also in Western Christianity. It is through this synthesis that it is vitally important to make the position of the historically united Orthodox Christianity heard and understood as contributing some novel ideas including not only a combat of modern atheism, secularism and nihilism but also of provoking an apprehension of cosmology [and culture] by Christian thought not only at an academic level, but incorporating cosmology into existential contexts of contemporary humanity in order to face the consequences of the all-encompassing scientific and technological invasion in the very core of the human condition.

The realisation of this objective implies an invitation for contemporary theology to work with a view to a synthesis which, historically, had been already in existence during the early patristic period. Thus the Christian theological consommation of cosmology should follow a similar route, adjusting factual *ecumenicity* of science to the *catholicity* of Christian faith. The appropriation of cosmology by theology, or science's consommation as justification through theology, will have to follow the historical example of the early

[21]That is, "une avant-garde du prolétariat de l'humanité", in words of J.-L. Marion (Marion 2010, p. 25).
[22] It is worth reminding the reader that what is generally known as the 'patristic' period corresponds to that historical era when fundamental Christian doctrines were fixed by the Fathers of the Church in a series of Church councils. The patristic period as understood within the Orthodox Christianity is often extended far beyond these 'official' historical limits until at least 14th century, the century of St. Gregory Palamas. In a sense, however, the patristic era never ended (see, e.g., (Ware 1997, p. 212)).
[23] Georgyi Vasilievich Florovskyi (1893-1979) was one of the most influential Russian Orthodox theologians in the 20th century, a philosopher and priest who had to emigrate from Russia after the revolution of 1917. A comprehensive account of life and work of G. Florovsky can be found in (Blane 1993). See also (Gavriluk 2015).

Church in the way it reacted to the Hellenistic philosophy and natural sciences and the views of the world of the time. It seems plausible to name such a strategy of appropriation of science as "a new patristic synthesis of theology and science". This new synthesis is envisaged as a mixture of premodern and postmodern exploration: its premodern character includes the invocation and recovery of a patristic ethos in which theology is inconceivable without its ascetic and mystical justification, as well as ecclesial communion; whereas its postmodern dimension, comprises all benefits of the latest philosophical development, including, first of all, its phenomenological advance. The sought synthesis as well as the objective of writing does not seek to discuss facts of the case as such (including theories as such facts) but rather to explore the relationship (communion) with the universe (though its study) as a mode of existence in the created universe. This implies not to follow the way of abstract and unfruitful comparative research between theology and science for the sake of some analogies and arbitrary schemes[24], but to articulate the encounter with the varieties universe's manifestation in human life as the ontological problem of incarnate existence inseparable from its source in God.

The appeal to the neopatristic strategy imported into the discourse of theology and science has justifications through historical parallels between the state of theology in the beginning of the 20th century and that one which one can be indicated nowadays. According to G. Florovsky, Orthodox theology in the 20th century experienced an existential crisis consisting in the separation of abstract theologising from liturgy, and the loss of the sense of tradition, in particular its adherence to Greek Patristics, understood as post-Christian Hellenism. In other words, the Church's consciousness was lost in academic theologising which stopped theology from thinking of the split between Eastern and Western Christianity, the antinomy of monasticism and secularity in the Church's existence (which indirectly contributed to the disintegration of the human spirit into religious and scientific (metaphysical) modes (that is dualism of faith and knowledge)), and addressing any issues related to society, politics, culture and science. Definitely theology captured by the nets of metaphysical and transcendental styles of thinking, devoid of links with ecclesial experience of God could not adequately grasp the trends of modern thought about the universe without its own renewal.

On a purely theological side, Florovsky argued that Christian theology (both in the East and in the West) needs renewal through restoration of its spiritually disintegrated mind in the unity of the tradition which is apostolic and patristic. The diversity of theological schools and ideas should acquire their intrinsic catholic context and the

[24] Typical examples of such schemes could be found, for example, in (Barbour 1990), and (Drees 1996).

mind of the Fathers of the united Church. It is in this sense that theology should be referred to the experience of the Church, to its ever-living tradition and its liturgy. Any academic theology without these grounds in the living experience of God loses sense and its role in ontological transfiguration of humanity.[25] Theology must return to its immediate historical and existential context, to human beings who are often forgotten in the course of abstract theologising.

There are two crucial elements in Florovsky's thinking: the first one is the immanent presence of the Holy Spirit in history after Pentecost[26], and the second one is the constant presence of Christ in history. Florovsky advocated the fusion of world history (sacred because of the participation of Christ in it and his ongoing presence) and Church history. He persuasively expressed this idea: "History of the Church is the mysterious process of the formation of redeemed humanity, which will be consummated and recapitulated and not simply judged and abrogated in the last days….There is an accumulation of permanent Christian values in the history of the Church, in the process of existential assessment of the divine truth and life."[27] This explains to some extent why Florovsky put so much stress on the old and new patristic synthesis not as an intellectual achievement of humanity but rather as its ecclesial achievement when Hellenistic philosophy, as an already existent manifestation of the human spirit, was involved into Christian ecclesial history through the Incarnation and Pentecost. It is in this latter sense that one can assert that the human spirit present in pre-Christian Hellenistic philosophy was acted upon by the Holy Spirit thus creating a unique patristic synthesis. One can then conjecture that in similarity to what happened in old patristic times the appeal to a neo-patristic synthesis in the 20th century (as well as by us in the 21st century) cannot be treated as mere historically contingent fact, but rather has features of a new break of the Holy Spirit into history in order to reaffirm Christianity in the modern world. Hence a neo-patristic synthesis reveals itself as a carrier of a "teleological idea" faithful to that of the Christianised Greek Hellenism of the past, in which the teleology of universal history of salvation, as authentic history and destiny of humanity, was articulated and understood by the Fathers of the Church.

A neo-patristic synthesis aims to unveil the most precious questions of the modern human condition in a theological frame of mind, which is not only anthropological but

[25] Independently of ecclesial theology phenomenology and existential philosophy, in their specific ways, were very sensitive to this issue. It is sufficient to remind one of Heidegger who insisted that the metaphysical God is an idea of God, in front of whom one cannot dance and to whom one cannot pray. Famously he claimed that a-theism, as the rejection of a god of metaphysics, was much closer to the dramatic perception of the living presence of God, than any sort of abstract philosophical theologising

[26] (Florovsky 1972[2], pp. 37, 45, 47).

[27] (Florovsky 1961, p. 205).

also ecclesiological.[28] Thus our attempt to involve science, as a cultural phenomenon, into the dialogue with theology along the lines of this Neo-Patristic existential trend is intrinsically ecclesiological. The impact of theology on the ever-evolving human condition can only be achieved "when theology shall return to the depths of the Church and lighten them from within, when reason shall find its centre in the heart, and when the heart shall mature through rational meditation."[29] In the same way as the reason, devoid of the light of the spiritual intellect and of the heart, cannot attain the clarity of truth in its own tendencies and its own historicity, the heart itself, devoid of the rational reflection upon its own movements and experiences, cannot make itself manifest to the public life of the Church; for what it (heart) lacks is exactly that which was called "theology" in a Patristic age, that is theology as demonstrated faith.

For Florovsky the lack of this maturation of the theological heart through rational meditation was associated with the abandonment of Patristic tradition and it is here that one can see the origin of his thesis that the goal of theology must be linked to the acquiring back the style and methods of the Fathers. However the acquisition of what Florovsky calls "Patristic mind" is not a sheer acquaintance with ancient texts and extraction of relevant quotations for modern arguments, it is rather the possession of the theology of the Fathers from *within*.[30] The acquisition of "Patristic mind" is thus the developing of a faculty of *intuition* which is capable of recognising in the Fathers the true witness and ever-present testimony of the Church, which survived all cataclysms of the Church history, as well as history in general[31], that is to recognising the underlying Reason (*logos*) in the development of the Church consciousness, the Reason which forms its *telos*. This means that the return to the past in terms of the Fathers' heritage does not imply the repetition of their sayings as borrowings from the past, but rather the restoration of the *spirit* of the Fathers as guiding us to the future in scientific research as well as culture. The reintegration of our mind with the spirit of the Fathers implies also

[28] It must be noticed here, however, that a neo-patristic synthesis does not pretend to build any accomplished and fixed anthropology, thus following a long tradition of the Christian East which never had any obligatory (to the faithful) system of views about man and cosmos. The Eastern theological attitude was very relaxed to the systems of knowledge based on secular science and philosophy, giving thus an unrestricted freedom in unveiling the human condition and abstaining from any attempt to treat the ever evolving debate about the human condition as the truth in the last instance (Zenkovsky 2005, p. 308). The intrinsic apophaticism toward anthropology guaranteed freedom to science and philosophy to express views about humanity without exhausting them entirely. The major stance of Christianity about the divine image in man can only be commented and supplemented by advances in science and philosophy, but it can never be abolished and reduced to any fixed conceptual expression.

[29] (Florovsky 1975[1], p. 191).

[30] (Florovsky 1975[1], p. 191).

[31] "Our contemporary world, atheistic and ridden with unbelief, is it not comparable in a sense with that pre-Christian world, renewed with all the same interweaving of false religious trends, sceptical and anti-God? In the face of such a world, theology must all the more become again a witness. The theological system cannot be a mere product of erudition, it cannot be born of philosophical reflection alone. It needs also the experience of prayer, spiritual concentration, pastoral solicitude" (Florovsky 1975[1], p. 207).

the restoration of our catholicity with the Fathers as that universal communion which can effectively validate the claim for the authority and truth, attained in the living tradition, in the midst of the contemporary postmodern cultural environment. However, the return to the Fathers must be creative. This implies that "one has to reassess both the problems and the answers of the Fathers" with an element of self-criticism. "We must not only retain the experience of the Fathers, but moreover develop it while discovering it, and use it in order to create a living work"[32], and this, according to Florovsky "brings us to the concept of a *Neopatristic synthesis,* as the task and aim of Orthodox theology today." [33]

It is evident that the ethos of a neo-patristic synthesis is to involve theological thinking into a historical process understood not as a contingent flux of events and happenings in human society, but as the *theanthropic process* which is determined by Biblical events whose *telos* is the union with God. This means that all particular modalities of the Church life and its theology, in spite of the fact that they can appear (to some non-ecclesial consciousness) as historically contingent and archaic, in their depth, have a meaning of being sanctified by the action of the Spirit of God upon different stages of human history. The manifestation of this sanctification, its historical incarnation, is the Church's worship, its eucharistic ontology as making the Church existent and alive. In patristic times theology was inconceivable without worship and it is as worshippers that the Orthodox always stayed in the tradition of the Fathers; this is the reason why "they must stand in the same tradition also as "theologians". In no other way can the integrity of Orthodox existence be retained and secured."[34] It follows that this is also the reason why a neo-patristic synthesis must be considered as the task and aim of Orthodox theology not only with respect to its own development but also with respect to its interaction with the world of contemporary culture, its philosophical and scientific thought.

All those who studied and developed old patristic ideas can be considered as the Fathers of the Church, for they contributed towards that patristic heritage which has a mode of perpetual existence, as has the Church itself. That is why those modern theologians of Orthodox Church who created their own individual and unique experiential way of communicating with God, must be studied and understood in order to continue the never-ending line of ecclesial fullness and tradition. It is in this sense that the tradition affirms itself as a never-ending and "living tradition"[35] and the age of

[32] (Florovsky 1975[1], p. 200).
[33] (Florovsky 1975[2], p. 22).
[34] (Florovsky 1975[2], p. 22).
[35] See the development of this term in (Meyendorf 1978).

the Fathers has not finished in the past. Those ascetics of the Orthodox Church who always lived with the mind of the Fathers through worship and liturgy give us a contemporary "practical" example of their own Patristic synthesis, which should be studied in order to retune one's mind for communion with the Fathers.

For Florovsky the acquisition of the "patristic mind" meant to see theology in the context of living faith which supplies all theological intellectual expositions by the immediate experience of God, without which any theology transforms into an "empty dialectics, a vain *polylogia*, without any spiritual consequence."[36] Florovsky argued for the integrity of theological thinking which included not so much citations and reading of the Scriptures and the Fathers, but, in fact, a prayerful communion with the Fathers as persons with their experience of God and life. This communion through the centuries can only be achieved within the integrity of the worshipping and eucharistic experience of the Church as a factor of its perpetuality and existence: "... it can be contended [that] the "age of the Fathers" still continues alive in the "Worshipping Church". Should we not recover "the mind of the Fathers" also in our theological thinking and confession? "Recover", indeed not as an archaic pose and habit, and not just as a venerable relic, but as an *existential attitude*, as a *spiritual orientation.*"[37] However the recovery of a *spiritual orientation* in a style and manner of the Fathers means, in fact, a change of the spirit of modern theologising from passive study and simple learning to a constant invocation of that Spirit who guided the Fathers and who allows us to enter communion with them. It is through this communion that contemporary theologising can acquire a reliable and novel path towards its future through its reference to the tradition, which is not a relic and dead sediment of the outgoing past, but, on the contrary, a spiritual *anticipation* of the past as the constant presence of the Spirit. Then all different aspects of human living activity will become seen through the constant presence of Christ in history which drives humanity to its eschatological destiny, and knowledge of which is being inaugurated by the Spirit in every liturgical invocation which is ever performed by the Church.

## The Existential Reintegration of Humanity as the Central Theme for a Neo-Patristic Synthesis

Patristic theology is relevant and appropriate in the contemporary world because it has an essentially existential character. Florovsky asserts that "the Fathers were wrestling with existential problems, with those revelations of the eternal issues which were

[36] (Florovsky 1972[3]), p. 108).
[37] (Florovsky 1975[2], p. 21).

described and recorded in Holy Scripture. [It] would make a suggestion that St. Athanasius and St. Augustine are much more up to date that many of our theological contemporaries"[38], and this is the reason why "what we need in Christendom 'in times such as this' is precisely a sound and existential theology."[39] Florovsky means here existential theology as opposite and entirely different to "strange ideologies" which form pseudo-theologies of a "modern" age. However the existential nature of theology for which Florovsky appeals in the context of a neo-patristic synthesis does not mean dealing with issues of life and death in an ordinary mundane sense but it asserts theology as a mode of being which itself is preoccupied with personal existence, existence and fullness of life as an *event* of communion with the Other. To be a contemporary theologian of a "patristic kind" means to live in faith, following God's will[40] (with respect to this, a particular theologian is a unique and irreducible event of existence), and carrying out the task of a neo-patristic synthesis as proclamation of truth about the Word of God.[41] Theology must become dialogical (not so much expounding some general things about God and the world) in order to talk about God in dialogue with living human beings, the dialogue which is inherently in God and with God. Thus theology as thought can never be detached from an existential action. J. Meyendorf refers to Greek Fathers in order to draw a parallel between the situation which Christianity faced in the first centuries of the first millennium and the task which Christian theology faces in our contemporary society: "the Church needs theology to solve *today's* problems, not to repeat ancient solutions to ancient problems. The Cappadocian Fathers are great theologians because they succeeded in preserving the content of the Christian Gospel when it faced the challenge of the Hellenistic philosophical world view. Without their partial acceptance and partial rejection of this world view, but first of all without their *understanding* of it, their theology would be meaningless.[42]

Seen along these lines, a neo-patristic synthesis should thus imply the *understanding* of the contemporary stream of thought, be it philosophy or science, from the perspective of communion events. Orthodoxy exists in the world which is dominated by scientific ideas and technological applications and where the human reason is tempted to believe in its sovereignty and power to control all aspects of being. It is in

[38] (Florovsky 1972[1], p. 16).
[39] (Florovsky 1972[1], p. 15).
[40] In St. Maximus' words to carry out the divine will means to have understanding of divine wisdom and through the holy way of life to make oneself fit to receive the Holy Spirit's indwelling and deifying presence. See *First Century of Various Texts*, 73 in *The Philokalia* vol. 2, p. 180.
[41] (Florovsky 1972[3], p. 108).
[42] (Meyendorff 1978, p. 168).

this sense that modern science and culture challenge theology and religion in general, and Orthodoxy in particular. It challenges the religious mind that is, it attempts to split the integrity of human persons to whom the reality of things is given in existential events where there is no separation between communion and being. Then the defence of the Christian stance on the meaning and value of human life, as well as their further articulation in face of technical progress, should assume that that rationality, which underlies the intellectual development of humankind and its technological overtaking of the world, must be contemplated as relevant and valuable only from within the very fact of existence of persons for whom their being is existentially inseparable from communion. As a result, some aspects of scientific and technological progress will have to be rejected, some others will have to be accepted. Scientific and philosophical ideas cannot just simply enter a fruitless dialectical dispute with theology; rather they should be involved and sanctified into the "logic" of existential events as well as ecclesial realities which articulate and disclose the meaning of these events.

As we mentioned above, in all modern forms of the dialogue between theology and science, as it exists in the West, the prevailing approach is based on the so called *natural attitude* of the human mind within which both theology and science are positioned as outward activities of human subjectivity, whereas the activity of the very human subjectivity is taken for granted and is not subjected to any introspection and analysis. It was easy in this approach to reveal the differences between theology and science as they are given to humanity in its historical incarnation. However, an attentive mind can immediately enquire whether those differences have a deep existential character and whether they can lead indeed to any tension between theology and science if both of them flourish from the same center: incarnate human subjectivity. It is by referring theology and science to immediate existential events that one can try to find the common root for both theology and science. But it can be anticipated in this case that the natural attitude dominating in the dialogue between theology and science must be suspended so that the problem of the dialogue becomes a problem of the split of intentionalities in one and the same subjectivity. But this should be done not in order to correct theology, or construct some pseudo-theological systems, but rather for a different purpose, namely, to demonstrate that Orthodox theological anthropology will necessarily have to study man in conditions such he is. This is the reason why theology is interested in that knowledge about man, which is accumulated by contemporary science. First of all theology is interested in the dialogue with those anthropological concepts which have been developed by philosophers in the last century; this is because in contradistinction from special sciences such as biology, psychology, sociology and

linguistics, philosophical anthropology aspires to reveal some essential characteristics of man, to understand his nature and his special place in the system of the world.

However, a neo-patristic synthesis is not to follow the logic of a vague unified synthesis of Christian life and thinking with some modern philosophical and scientific ideas. This kind of synthesis would result in another intellectual monstrosity with no existential consequences. What is important is that all philosophical and anthropological stances in modern philosophy will have to be met with a grain of discernment. In many ways the quest for the meaning of human existence and the essence of the human condition in the universe (as it is asserted in science and philosophy) must be taken into account only to the limited telling Orthodox theology exactly what the meaning of personal life *is not* and what the sense of the hypostatic human condition *is not*.[43] It does not mean that Orthodox theology judges or rejects any achievements of modern philosophy and anthropology; on the contrary, it takes all of them as its own problems which have to be known and mediated (not accommodated) in order to find a new way forward. However this keeps Orthodox theology away from a naïve hope of finding an all-encompassing synthesis in one particular historical period: this synthesis can only be thought as an eschatological task. It is only in this, very specific, sense that one can hope that the sciences whose meaning being elucidated and judged by theology, will have to "acquire" existential features, that is, to be seen not as abstract ideas and exotic theories about the outer world, but as those human activities which are intrinsically linked to the existential anxieties and spiritual aspirations of humanity.

Theology with all its faithfulness to the *living tradition* of the Church has to evolve in order to become *existential* not only in abstract philosophical terms as being imbued with anthropological issues, but existential in the sense that its fundamentals, that is the Church's definitions and dogmas, become a true guidance for people living in the contemporary culture. [44] No genuine meaning of human existence as life in history and

[43] One implies here not simply that all modern anthropology and psychology are *de facto* apophatic, for they deal not with living persons but only the signifiers of persons that never exhaust the sense of that what is signified, but theological recognition that human person is unknowable in principle because it carries a Divine image, that is an image of the unknowable. The classical example of this conviction can be found in St. Gregory of Nyssa's *On the making of man*, 11. See more on this issue (Marion 2005).

[44] Here, in what concerns the development of theology, the thought of S. Bulgakov is indicative: "…One must clearly understand unavoidability of the dogmatic development in disclosure of the ecclesial self-consciousness, although its different expressions have only Church-historical origin and pragmatic character" (Bulgakov1991, p. 86). See also (Bulgakov 1937, p. 20). In this context it is interesting to quote J. Zizioulas, pointing to a delicate character of the possible renewal of the dogmatic content of faith: "There is a prevailing view among so called "conservative" Orthodox theologians that the doctrines of the Church constitute something "untouchable". This turns dogmas into petrified relics from the past and widens the chasm between the historical and eschatological perspectives of the continuity of the apostolic kerygma. A study of the early Church and an appreciation of the Eucharistic basis of doctrine, however, show that it is better to understand dogmas as doxological statements of the community as the "faith transmitted *to the*

culture can be found outside religious anthropology with its experience of the ineffable mystery of that who can say "I am Who I am". In the same way as the supreme existential mystery of the Sinaite revelation cannot be objectified and understood apart from participation in the speech of God, existence in the created world (that is, the existence of the universe as well as human beings in it) can only be understood through an ontological modality of humanity which can be expressed as *existence- participation* and which is impossible to define discursively for it carries in itself some objective uncertainty. In all attempts to grasp the mystery of the facticity of existence of human persons, the actualisation of the very event when a human person is conceived in the midst of physical and biological nature can only be interpreted through the reference to the Bible, which speaks about the creation of man not as a result of an impersonal interplay of chance and necessity in nature but as an act of personal loving relationship with God, which places all sorts of questioning about existence in general (why there is something than nothing?) in the realm of constitution of the created in experience of communion with God.[45]

Humanity is defined through the universal participation of its finite representatives in the divine infinite: this is exemplified by Christ and as a commitment is embodied in particular social practices and cultural activities. The stance on participation brings not only a new vision of anthropology, but also new ontology (with all sorts of reservation which accompany the usage of this term). The latter can be characterised as relational ontology (in the sense which is used in a Trinitarian context when it is not situated between two or three poles but rather remains at both or three at once), as well as an ontology of a gift, that is not as not self-subsistent existence; this ontology is relational upon the transcendent source and as such, that is in its concreteness, is a gift. The entrance of the gift in the ecclesial ontology of Christian being naturally bring an Eucharistic response to this gift thus placing an abstract philosophising on ontology in a concrete ecclesial framework. Speaking differently, the claimed universality of Christian existence reveals itself in specific and concrete events of the Church life. Theology with its attitude to the world receives its proper place in the Church for which theology is her voice. Science, culture and politics as a mode of human activity and thus, by definition

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*saints*", constantly received and re-received by the consciousness of "community of the saints" in new forms of experience and with a constant openness to the future" (J. Zizioulas, 1997, pp. 191-92).

[45] This way one can overcome M. Heidegger's objection that one cannot speak of creation from any philosophical position which is neutral to faith. Heidegger claimed that a biblical response to the metaphysical question about the origin of existents is inappropriate. See, for example, (Heidegger 1959, p. 6-7). The Church Fathers, including those of St. Augusitine and St. Maximus the Confessor, understood quite well that the language of existents cannot be applied to the question of creation and that creation belongs to the liturgical usage from within which creation is acknowledged, established, that is constituted (see, for example, (Marion 2008, pp. 315-24)).

being involved in speech of the world together with theology, will have to become a different way of expressing the Sinaite revelation "I am Who I am" (Exod. 3.14). Being in a mode of relationality and gifted with existence, Christians contemplate being as being of Someone, for if there is no personal origin, there is no being at all. This implies that the universe of beings, as opposed to non-being, exists only in that one, who can affirm about his being through the universal voice "I am Who I am". The challenge for theology to mediate with culture and science is to convince the latter to contemplate the universe as inherent in the person of God, so that cultural dynamics and cosmological anxieties are too loose their meaning as outward and impersonal objectifications, and to express in themselves the presence of the image of the Person of God in the world revealed to the created humanity. But this requires that human beings will treat themselves not as impersonal physico-biological creatures whose life is driven by dispassionate laws of nature and who are doomed to decay and die, but as those agencies in the universe who possess in their inner essence the image of the Personal God, the image of Christ and the life-giving energy of the Holy Spirit and who through their communion with God establish harmony and the sense of life. The interfertilisation of theological realism and scientific or cultural realism aims to bring to light the intensity of a particular instance of existence through the events of communion with the Personal God who reveals himself by the *light of a knowledge* which is not a meaning or concept, but a name and a person, Jesus Christ. By participating in dialogue with the hypostasis of Christ one begins to comprehend the *matter* of the world not as alien landscape of the contingent natural forces and empty spaces but as the realization of the command of God "Let there be light". It is through this light of Christ present in the world and sustaining our existence, as well as in the *light of knowledge*, that culture and science as manifesting an exemplary human existence become possible at all. Thus understood, culture and science can be reinstated to its proper status in communion with God. This opens a way to a mediation between culture, science and theology in a uniquely different way which can be summarised through saying that all components of such a mediation constitute themselves through appropriation of each other. The challenge then is to be aware of the fundamental limits imposed on our effort to engage culture and science into interaction with the theological realism if the whole enterprise is expected to be accessible to the wider academic and ecclesial communities and communicated in such words and writings which will enable a media for general discussion. What are these limits? Essentially they are limiting abilities to imagine and speak about God on the grounds of discursive reason and rational thinking in general.

Here one means that any philosophically advanced means of delivering theology in unrelated to historical facticity and eventuality of the revelation terms will fall in the trap of the Enlightenment's claim for the universality of the public reason and its ability to judge about events related to the Christian tradition. This "pure" Christian reason would obviously risks to lose any affiliation with ecclesial setting of Christianity which makes it distinctively different from other religious traditions. Correspondingly, to preserve the true spirit and uniqueness of the Christian revelation and tradition in the background of the global space and time of the universe, as well as inside human history, this allegedly "pure" Christian reason itself must be criticised (in analogy with the Kantian critique of reason), placed in the framework of humanity endowed not only with the transcendental faculties, but with the Christ-centred personhood. In this sense the uniqueness of any particular saint or a Patristic writer is exactly in that, that the most general Logos (Wisdom) becomes manifest through and by the Spirit in a concrete and particular. This, however, does not imply that the cosmic, as well as cultural and social aspects of the human hypostatic existence are neglected and replaced in favour of the historically contingent and inter-personal. The issue is that the elucidation between universal and particular can receive its existential resolution only through ecclesial experience, where the concrete universality of the Eucharist makes it possible to resolve the perennial dichotomy between the illusionary and transient physical existence on the one hand, and the intentional, Divine-given infinitude, on the other hand. The overcoming of secularisation in appropriation of culture and science can thus be achieved if the transcendent-blind attitude to reality is subjected to the transforming *metanoia* originating in ecclesial events. It is here, that the Christian stance on the nature of reality and its particular realisation in the neo-patristic synthesis can have a fundamental effect on human anthropology, which being cascaded towards society, politics, technology and culture could form a definite alternative modern version of historical materialism. In this sense the Neo-Patristic Synthesis in theology, endeavoured by Florovsky and Orthodox followers (as well as Catholic and Protestant theologians) in the middle of the 20th century as an attempt to neutralise the destructive scientific atheism and secularism, can be considered as a historical attempt to fight the de-Christianisation of Europe and the whole world and which is worth of being advanced nowadays. The objective of such a move would be not to promote a kind of new-born religious fundamentalism, but a mediating and critical approach to reality of the human world in its totality which would allow humanity to conceive the sense of its own existence in the background of the created universe. By so doing, Christian stance

through the neo-Patristic synthesis would contribute to the mediation between theology and scientific ideology acquired and exploited by contemporary adherents of atheism.

## A Neo-Patristic perspective on knowledge

The validity and justification for implementing the idea of Neo-Patristic Synthesis in modern world can come only if the objective of theology will be to re-engage with and transfigure the world in all its aspects, including not only the world of passive nature, but the world of the human society, its scientifico-technological, cultural and political dimensions. For this purpose Christianity possesses that One, after whom its followers call themselves Christians. In other words, the Christian attitude to the world and its possible theological transformation has it ground in the incarnate Logos, Jesus Christ. Since Christ remains an ultimate archetype of all possible ways of implementing engagement and transfiguration, the transformation of all implies the transformation in man in a way opposite, but mutually consistent, with the Incarnation, namely human deification as the way of seeing and acting in the world as much closer to that one of Christ: "As much as God is humanised to man through love for mankind, so much is man able to deify himself to God through love".[46] The deification implies that man as *microcosmos* capable not only of articulating the whole universe, but making it more and more humanised, that is *makroanthropos.*[47] In this sense theology makes cosmology and anthropology intertwined. This idea can be traced in the Church Fathers, in particular in Nemesius of Emesa and Maximus the Confessor. Not only the basic difference between sensible and intelligible in creation is reflected in man, but all *divisions* in the cosmos are to be mediated by man in order to restore the prelapserian archetypical unity of "all in all" in God. Practically this means to perceive and apprehend the created universe in its variety by referring it to the center and the source if its *enhypoistasisation*, that is the Logos-Christ. The universe as physical creation will keep its difference from God, but its vision and the sense become more transparent and soteriologically significant as if it would take place through the eyes of the Logos Himself. The accomplishment of this process requires *metanoia* (change of mind) and purification of the heart. This process

[46] St. Maximus the Confessor, *Ambigua* 10 [PG91: 1113D].

[47] The idea of makroanthropos developed by Maximus amount to that man becomes the world at large. It conveys the meaning that the world is called to be humanized, that is to bear the stamp of the human and to become-pan human. This notion also carries another important meaning, namely that, according to Maximus it is not man that is called to become "cosmosized"`, but the whole cosmos to become humanized. The destiny of the cosmos is found in man, but not man's destiny in the cosmos. In this view it is the history of the universe becomes a part of the history of humanity, so that the cosmos is not only a matter of theoretical investigation, but the medium of the human existence servicing it in a practical way.

relies on the preservation of the *logos*[48] of humanity through changing its *tropos*[49], as a mode of existence. The natural assumption in St Maximus the Confessor's time was that the *logos* of human nature, relying on the physical and biological stuff of the created universe, cannot be subjected to such a drastic change that the hypostatic union of body and soul will not stand. Using different words, Maximus assumed that the way of deification excludes any misuse of creation, such that the *logos* of the human nature could be threatened at all. In this sense, according to patristic writers, even the process of creative transformation of the world does not imply, that through the changing of the *tropos* of humanity, this very humanity can change the *logos* of human nature simply by destroying incarnate humanity as such, for example through the technical implementation of the scientific "progress".[50] Thus the patristic vision of the destiny of humanity remains limited, simply because its era and milieu did not foresee the accelerating and drastic domination of science in human life after the 17th century. For example, Maximus the Confessor, as a thinker of the 7th century, while not being engaged with the world outside the Church, did not contribute to the theory of culture and its scientific mode. Correspondingly, if one attempts further a theological appropriation of the modern world along the neo-Patristic synthesis one needs to place theology in the context of the modern discourse on society, politics, culture and science. Thus the Neo-Patristic Synthesis' orientation becomes radical in that its aspect, that the participation in the Church mysteries is considered as making possible for theological knowledge to mediate all other forms of knowledge placed in human culture and dependent on social and political factors. In this sense the neo-Patristic synthesis is a tendency for transcendence beyond the boundaries of knowledge that is it is theological per se. It destined to become a radical form of mediation between of all forms of knowledge bringing to a new light the fact that any knowledge is a gift. This mediation implies that modern theology needs to learn from the ways in which this *gift* of knowledge has not always been embodied in the life of the Church and in Christian tradition. Thus, while the Neo-Patristic Synthesis appeals to the Church and its roots, its patterns of thought and the whole ethos does not exclude to treat these roots as bearing witness to *all* of humanity. The pattern of relationship between humanity and God which is displayed in the Church as a gift and possibility is open to humanity *at large*, in particular in that

[48] The Greek usage of the term *logos* in the context of human nature means the underlying and forming principle of humanity, that immanent and transcendent foundation which justifies the contingent facticity of every creature.

[49] The term *tropos*, in contradistinction with *logos*, signifies a mode or a way of existence within the givenness of the *logos*, the latter being the principle of this existence.

[50] One implies here that abuse of science as misuse of creation which have been characterized in Orthodox literature as diminution of humanity, dehumanization of nature and its desanctification (see, for example, (Sherrard 1991)).

which is concerned with their understanding of its place in creation in view of new knowledge. However this understanding is not to assimilate and dissolve the essence of theological gift-oriented vision of the world thus keeping theology within its unshakable pillars of faith, ecclesial tradition and communion. The very possibility of knowledge as a gift is manifested through the Divine image in man following from Christ, as a centre of the gift of Christian theology. Thus theology must be capable of understanding modern ways of living and thinking and, at the same time, of being a criticising modality of life[51], remembering that all modes of the human activity represent a radical gift of existence, of life whose ontological priority proceeds from God. In this case all compartmental and educated apprehension of reality, including nature, society and humanity, science itself receives its justification and understanding in terms of the radical gift of the dynamic *theo-logia*, that is of the pre-predicative sense of existence in God and through God. The challenge of the theological commitment along the lines of the Neo-Patristic Synthesis is to bring to a new light this intrinsic conviction of the Fathers of the Church.

The Fathers of the Church were engaged with society at large and its trends of culture and science only to the extent they had to defend faith within their surrounding culture and make it demonstrable. In this they did not advance their understanding and foreseeing of the historical development of culture and science. Thus their relevance to contemporary problems posed by postmodernity and modern atheistic and secular trends is limited. However even in the conditions of such a limitation the main line of the Fathers' thinking remains never irrelevant and outdated, namely that knowledge as an indispensible mode of culture (and of the *microcosmic* transformation of the world into *makroanthropos*) is the Divine gift, so that any attempt to detach this knowledge from its inner source in life of man (as a central primitive world - this is an implicitly phenomenological stance) deprives this knowledge of any existential and soteriological sense. Here comes a radical approach to the very possibility of knowledge of the world, including humanity and society, as originating in God. This stance is not an extreme fideistic position *per se*, but rather the reenactment of the stance on knowledge and

[51] The sphere of operation of theological critical thinking is in all realms where the Church (ecclesial humanity) meets historical and cultural reality. Theology creatively and critically thinks of any emerging historical problem or scientific theme, while remaining in the immutable state of the Church's spiritual life, because this life is experience of God, that is, of eternity In words of D. Staniloae: "The very existence of the Church is an effect, continually renewed of the action of the Holy Spirit in creating communion" "The door of the infinite riches of the personal or interpersonal divine being has opened up before the reflections of Orthodox theology, and with it the prospects of an endless progress of the human spirit within the divine" (Staniloae 1980, p. 218). Analogously Metropolitan Filaret describes the paradox of the Church mission in 'this world' as "that the power of the ecclesial influence of the world directly depends on the ability of the Church to be 'bigger than the word', to transcend the world and to see it through the 'Divine vision' " (Filaret 2004, p. 53). Thus theology always functions from above mass-religious consciousness, as well as "secular" scientific consciousness which claims its freedom from any faith commitments; theology's unceasing task is to provide a constant and constructive critique of these modes of consciousness by referring them to the original divine image in humanity.

education in premodern times. Indeed one can provide the reader with a couple of examples related to patristic times. The Fathers of the Church always appreciated the special nature of knowledge (in modern parlance the "sciences") and its *limited* ability to talk about the nature of things. For example, according to Gregory of Nazianzus (Theologian): "Granted you have a grasp of revolutions orbits, ... and all other subjects you take such inordinate pride in knowing, this is not a real grasp of the actual things by any means. No, observation of a certain movement is confirmed by further exercise and unifies the observations made by many others. It then thinks out a rule and gets the title 'knowledge'....But if you are very knowledgeable of these subjects and are on the look-out for proper respect, explain the cause of the order and movement."[52]

The surface appearances as such, even if they are combined in groups and law-like patterns, do not shed the light on the ultimate sense of things, their *logoi*, that is the contingent facticity of thing, their ordering and movements. As was expressed by Olivier Clément: " Since every created thing has its own point of an encounter with the divine energy, the virginal divine point, *logos*, sophianité which simultaneously justifies it and magnetizes it towards its fullness. Without *logos*, name there would be in created being only a chocking absurdity of the deaf and dumb masses in the abyss of darkness."[53] Since knowledge of any thing implies the hearing and communing with the effective *word*, every tiny thing is to manifest the Triune Creator, in which the Logos is inseparable from Pneuma. The very being of things links to the source of their existence in the Father. Their intelligibility, so to speak of a logical order, links them to the Logos, and their life as motion points toward the presence of the Holy Spirit, the giver of Life, that grants them ground and fills them.

Long before Maximus Clement of Alexandria attempted to formalise a similar conviction of the grounded nature of knowledge in the Divine by using philosophical tools. Speaking of knowledge Clement related it to the enquiry into the nature of truth as something which is all-embracing, including all particular truths. Truth is one, and it is God's truth. That is why, according to Clement, philosophy or the sciences are characterized by investigation into truth and the nature of things. [54] But this is not a divine truth (Strom. I:6.); rather, it is a partial truth. Philosophy can contribute to the comprehension of truth, "not as being the cause of comprehension, but a cause along with other things, and co-operator; perhaps also a joint cause" (Strom. I:20). Similarly there is only partial truth in the sciences: "In geometry there is the truth of geometry; in

[52] St. Gregory the Theologian, Oration, XXVIII, 29. This English translation is from (Norris 1991, p. 242).
[53] (Clément 1976, p. 86).
54 Clement of Alexandria, The Stromatata, or Miscellanies, Book I, Ch. 5 (abbr. Strom. I, 5) [English translation is from: ANF, vol. 2].

music, that of music; and in right philosophy, there will be Hellenic truth" (Ibid.). Clement claims that the Greeks, through the *gift* of reasoning granted to them by God, approached this truth but did not manage to collect together the divided truth and to find its source in the Logos of God: (Strom. I: 13). Philosophical knowledge as such is incomplete, for 'it cannot by itself produce the right effect' (Ibid.). Clement contrasts it with the Christian teaching, 'which is according to the Saviour, is complete in itself and without defect, being "the power and wisdom of God" ' (Ibid.).

The Greek philosophers, according to Clement, participated in the truth that comes from the Logos, but they did not see this truth because they did not have faith in the Logos of God and thus could not have access to the only true demonstration which is supplied on the basis of the Scriptures. This is why a demonstration based on opinion cannot be qualified as divine, but only as human, i.e. as mere rhetoric, whereas a demonstration that is based on reasoned knowledge produces faith in those who wish to learn of God through examination of the Scriptures. This faith that is supported by philosophical methods is called by Clement a considered faith, i.e. a gnosis, and, according to Clement, forms the subject matter of theology. Clement has formulated a methodological principle that allows one to treat sciences and philosophy as two different ways of knowing which cooperate in truth. Whatever science and philosophy offer to theology it can easily be incorporated by the latter for the purpose of deepening and extending faith within the boundaries of the Church's definitions.[55]

Having faith in God and understanding that the appearances of things never grant access to ultimate truth, the Divine gift of discernment and contemplation of the natural things was used with the purpose of looking beyond empirical appearances for indications of the Divine presence in nature, and they never allowed their thought to degenerate into pantheism. They firmly maintained the fundamental Christian gift, that is faith that the transcendent God of the Scriptures created the world *ex nihilo*, and that He is present in the world through the divine *logoi* of all created things. [56] Thus the Fathers considered their primary task to interpret scientific knowledge theologically, thereby criticising, delimiting and at the same time pointing to its ultimate source in the Divine gift to humanity to articulate and summate the universe.

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55V. Lossky rephrased this thought: "Christian theology is able to accommodate itself very easily to any scientific theory of the universe, provided that this does not attempt to go beyond its own boundaries and begins impertinently to deny things which are outside its own field of vision" (Lossky 1957, p. 106).

[56]The notion of the *logoi* which were extensively developed in theology of St. Maximus the Confessor in the VI century, can be also found in the Church writes before him. For example in St. Gregory the Theologian *Orations* XXVIII,16; XXX.20; XXXII.7, XLIII.67; in St. Gregory of Nyssa *On the Making of Man*, 24; in St. Basil the Great, *The Hexaemeron*, I:7-8; in St. Dionysisus the Areopagite, *The Divine Names*, V:7-8; in Evagrius Ponticus , *The Prakticos*, 92. The concept of the "seminal reasons", similar to the *logoi* was also developed by St. Augustine of Hippo.

To see truth behind the empirical appearances the Fathers employed contemplation (*theoria*) of the the *logoi* of created things (as their immutable and eternal principles).[57] Maximus the Confessor considered the contemplation of the *logoi* of created things as a mode of communion with the Logos leading ultimately to mystical union with God. The fundamental aspect of this communion is that it must be exercised through the purified intellect (*nous*), so that the contemplation of the *logoi* is not the same as either empirical perception or mental comprehension. It is a mode of spiritual vision of reality, where the ontological roots of things and beings are seen as having their grounds in their trans-worldly otherness. Is such a contemplation relevant for knowledge achieved through modern scientific research? Indeed, scientific research usually starts from things which constitute our sense of ordinary reality, though sometimes mediated by experimental apparatus. However, there is another aspect of scientific investigation which involves the shaping of contingent empirical findings into a theory. This requires access to symbolic language, mathematics for example, which makes it possible to talk about intelligible entities standing "behind" the outcomes of our measurements (this takes place when physics talks of elementary particles, fields, global geometry, the totality of the universe, etc). It is understood at present that this way of looking at reality corresponds to what is called rationality. The source of this rationality is hidden in the divine gift of representing the universe as it was seen by the Logos-Christ. It is only because of the existence of this divine dimension in human beings that it is possible to infer from nature to the presence of the divine intentions behind created things. [58]

According to Maximus, the Divine Logos is present in all things, holding their *logoi* together. Thus the world is filled with the divine reality, and man, in accordance with his *logos*, can have knowledge of the *logoi* of things: "Indeed, the scientific research of what is really true will have its forces weakened and its procedure embarrassed, if the mind cannot comprehend *how* God is in the *logos* of every special thing and likewise in all the *logoi* according to which all things exist." [59] Man knows things from nature, in their *differentiated* mode, and creation is seen as (morally) *divided* into parts. Whereas the natural contemplation of things means the knowledge of the principles of existence of

[57]On Maximus' theory of the *logoi* see e.g. (Thunberg 1995, pp. 64-79) and (Thunberg 1985, pp. 134- 143). See also (Balthasar 2003), as well as (Larchet 1996).

[58] One should mention, however that the natural contemplation which St. Maximus used for description of knowledge of the *logoi* in their unity, which provides an access to the Logos of God, being organically a sort of communion with God, assumes that the Holy Spirit is present in this communion. This means that God opens His mystery only to those who do not speculate abstractly about the high being and origin of the world, but for whom the communion through the works of the Logos is accompanied by the communion through Scripture, as well as by the sacramental communion with Christ.

[59] St. Maximus the Confessor, *Ambigua*, 22 [PG 1257 A] [This English translation from French ((Riou 1973, p. 60)) is by L. Thunberg (Thunberg 1985, p. 140)].

things in their differentiation, the mediation between moral *divisions* in creation is to bring all sensible creation through the unity of the *logoi* of sensible things in one Divine Logos which constitutes the principle of creation. In order to achieve this contemplation man must have a gift of being detached from sensible creation to see things spiritually. This kind of contemplation of natural things is compared by Maximus with the angelic knowledge of sensible things, for angels know the *logoi* of sensible things directly, as it were, 'from above'. Because the Incarnation, according to Maximus, takes place in the words of the Scripture, but also in the *logoi* of things that are held together in the universal Logos, spiritual ascent through the contemplation of the *logoi* of creation is destined to lead to the Logos-Christ. The *knowledge* of things of the *world* thus acquires all the features of *participation* in the *divine*: "On the account of the presence of the Logos in all things, holding their *logoi* together, the world is pregnant with divine reality, and knowledge of it - through the rational quality of man, his own *logos* - is itself a kind of communion with God, a participation in divine things through the aims and purposes that are recognized in creation." [60] The natural contemplation of the different *logoi* in the one Logos thus manifests the exodus of man from this world to God, as the truth of the whole of creation is revealed by and in the Logos of God Himself. Maximus treats all of this mystagogically, that is as a liturgical process on a cosmic scale: the "cosmic liturgy."[61]

Saying all this, it was characteristic of Maximus and of the Greek Fathers in general that they could transcend spiritually the material world in order to contemplate its *logoi*, and through this contemplation praise the Creator of the natural world. Afterwards they could come back to nature and see it in a new light, from the perspective of its ends and purposes, from the perspective of the Christ the Logos. For the Fathers that which we call nowadays nature was empty before Christ. Its true meaning was opened to us only through the mystery of the Incarnation. But the Fathers, though worshipping the uncreated through nature, were always aware of the danger of pantheism, for the passage between material and spiritual (as the easiest mental image of the uncreated) was made with such an ease that the fundamental distinction between them could be confused. The Fathers never worshipped nature, but only its Creator. This is why when we speak of the 'cosmic liturgy' of Maximus as a form of mediation between heaven and earth, visible and invisible we must remember that the overcoming of the divisions in the creation on the moral level does not imply the elimination of ontological differences. Praying to the Creator does not remove the distinction between Him and the creation.

[60] (Thunberg 1985, p. 127).
[61] See (Thunberg 1995, p. 397). The term "cosmic liturgy" appeared in the title of Balthasar's book (Balthasar 2003). See an interesting accentuation of this motive in (Cretien 2004, ch. 5).

God and nature are not identical, but one may seek access to nature in order to find God, and, vice versa it is through faith in God that nature can be disclosed in its true names at all.

By interpreting knowledge and nature theologically, through faith in God, the Fathers of the Church did not advance understanding and foreseeing of the historical development of culture and science (in fact, this was not their task as defenders and promoters of Christian faith). This is the reason why any advocacy for the relevance of Neo-Patristic Synthesis in our age must extend it scope much further than the old Patristic Synthesis in what concerns a theological judgement of human cultural and scientific activity related to the present age. But this in turn requires one to deal not only with epistemological questions, such as the dialogue between theology and science, but with action as long as science is considered to be a practice affecting the human condition and changing the world in accordance with the soteriological tasks. The task of humanity is to bring (through action) nature, society and humanity (as empirical reality) to their high level, to transfigure them in such a way that their *logical* and *sophianic* essence could receive full realisation. One speaks here of the realisation and establishment of that principle of the Divine presence in the world which unifies different parts of the human activity, such as politics, economics, science and culture. The detection of such a principle could be done through human creativity and many-faceted reality of the world (disclosed through the sciences) even if the latter do not have any direct relation to the aspects of life of Christian Church. Then one can talk about new comprehension of Christianity, its new revelation which does not change Christianity, but brings it to a new comprehension. [62] However human creativity must not be absolutized, not only because human beings cannot produce anything new in the sense of creation (and thus they are doomed to deal with recreation and replication of something which is already given[63]), Christian theology must appropriate this creativity *creatively*, that is *critically*.[64] This means that all human creativity as being embedded in the fabric of the created can have a theological sense and justification if it serves to the

[62] C.f. (Bulgakov 1999, p. 282).
[63] C.f. (Bulgakov 2002, p. 321).
[64] Theology asserts itself as a *meta-discourse*, that is, as that form of critical thinking about different modalities of social activity, including a scientific one, which expresses the Divine presence and action, and which is not being bounded or exploited by some other particular human activities as their "prophetic" voice, be it the socio-historical sciences or a kind of all-encompassing transcendental philosophy. The critical function of theology with respect to other discourses never allows theology to slip into such a position that its scope and place will be determined by other discourses, for example by the science-religion dialogue as such. In this sense theology can never be defined and positioned by secular reason and thus it does not accept the idea of a complete autonomy of that sphere of the worldly reality which is asserted through rational, that is scientific, understanding. As it is emphatically advocated by J.-L. Marion, theology deals with the saturated phenomena, whose phenomenality cannot be embraced by means of scientific analysis.

goal of bringing man and the universe closer to God, that is to make creation humanised. If this pregiven soteriological objective is ignored, all human activity could finish with producing a demonic and non-human world, dimmed of truth and the divine light. The last point is of utmost importance because humanity, in order to preserve its archetype of the divine and human Christ, must preserve the *logos* of its own nature in all creative acts by changing and renewing only the *tropos* of its nature. However this exactly represents a serious problem in the present state of humanity, which by "experimenting" with nature through scientifico-technological (as well as indirectly social and political) changes of it *tropos* of existence, risks not only not to preserve the *logos* of its own nature, but, in fact to annihilate its incarnate presence at all. The danger here is that this gross imbalance in preserving human nature (which effectively removes the archetypical image of the incarnate Christ) could distort and even irreversibly deflect the Christian understanding of the relationship between God and humanity. If this would happen humanity will be capable of proclaiming its own independence from God thus "deifying" itself and the whole created universe. In this, the existential communion with God will be lost and the whole of the human creativity will become deviated from its originary set true soteriological *telos*.

Christianity, as a social phenomenon could remain exercising its normative practice, in particular justifying and judging other non-Christian activities. However the broken unity of knowledge of the world in God and God in the world, within humanity inevitably leads to polarisation between secular knowledge and theology. Secularism becomes manifest exactly as a consequence of the excess in the degree of changing the *tropos* of its nature (resulting in a change of anthropology) with respect to its *logos*. Saying bluntly, secularism emerges as the inevitable consequence of the deficient anthropology. Deficient anthropology transforms theological ontology of existence into *onto-theology* (that is metaphysical theology devoid of any existential meaning): the Revelation and communion become to function as onto-theological notions (as artefacts of non-existential discourse), devoid of existential meaning and eucharistically sacramental character. Theology as experience of God becomes detached from secular creativity, so that, de facto, creativity within Christianity becomes impossible. Hence any project of Christian culture or science seems to be existentially viable as explicitly opposing to secularism.

Here we face a problem of how to reconcile the appropriation of the modern secular scientific culture by Christianity keeping its fidelity to what is called tradition. Tradition, in theology, means first of all that theology is not an ingenious accomplishment of an individual religious philosopher, and it is not a simple cumulative

result of generations of religious meditation; it is the integrity of religious experience within the Church, its intrinsic Catholicity, which is affirmed through the interaction of the human spirit with the Spirit of God. For theology tradition is not only "repetition" of those religious events which are commemorated liturgically, it is not only reciting the texts and passive reading of the Fathers of the Church. It is rather the process of the constant invocation of the presence of the Spirit of God in the Church and in the world, the invocation which (in its uniformity with the past), carries out an ontological element of a never-ending hypostasization of the reality of the Church as well as its theology. In this sense tradition can be understood beyond the famous dichotomy between sedimentation and innovation. Being a living tradition it is an evolving tradition: it faces challenges from the evolving humanity which sometimes is driven by unintentional and impersonal dramatic urges, related to society its politics, culture and science. It is in this sense that the presence of tradition is a constant reminder that human subjectivity should involve itself in its own re-assessment through positioning itself in tradition. However, what is popularly called the renewal or revival of tradition is not an exit from this tradition, it is rather a critical and non-accomodating acquisition of new ideas within the same tradition, but in the context of the present age. It is through the efficacy of the past in the present of religious experience, that theology cannot take the arbitrary forms and developments which postmodern secular trends of thinking would like to promote. Theology remains that sphere of the human existence through which the secular processes can be mediated, but not accommodated. The latter can be explicated through the radical stance on secular culture and science following from the requirement that ecclesial theology must draw a clear borderline between the dispassionate contemplation of what happens in modern culture and science and its involvement in it. By not accommodating secular culture and science, ecclesial and hence tradition-imbued theology is endowed with the right to judge secular world through its consistent and permanent critique. However, its radical critique of the scientifically asserted world does not preclude this same theology from being radically positive with respect to science and the world. What Orthodox theology judges is the alleged autonomy and independence of the scientific view of the world from the very intricate inherence in the human and hence in the Divine.[65] By so doing theology speaks of something which is not God, but it recognises a clear difference in this speaking. The positive judgement of science and the world as the distinct from Christianity and God originates from the sanctification which existential ecclesial theology undertakes by

[65] C.f. (Nellas 1997, pp. 93-104).

bringing all fruits of human labour, including science and its picture of the world, to the their correct operation in the wholeness of communion.

It is imperative to discern which new insights in the history of ideas must be embraced and addressed by Christian theology. The creative activity which led to the rise of western secular culture has always been recognised and mediated by the Christian tradition: "Theology today must remain open to embrace both humanity and the cosmos; it must take into account both the aspirations of all mankind and the results of modern science and technology."[66] Creativity which is manifested through scientific research and cultural activity, in fact represents a permanent task of the Church itself. The tradition of the Church is living and evolving, for Orthodoxy, in a proper sense of this term, is itself an infinite task. Correspondingly Orthodoxy implies transmission through the overcoming a dichotomy between sedimentation and innovation in the core of the human history theologically understood as synergy between man and God along the promised *telos* of salvation. It is faithfulness to the tradition which balances the unrestrained urges for innovation and unnoticed slide to secularism that discerns the danger of making socially optimistic claims while amending and "accomplishing" theology in the present age. If innovation is a tendency, it has an open-ended character and thus its sense can only be grasped in the perspective of the age to come. Realised eschatology ordains *realised innovation*. In this sense all innovations implied by the Neo-Patristic Synthesis have sense only through their constant Eucharistic re-assessment. It is in this sense that the truth of secular culture and science can only be assessed through assigning them a para-eucharistic modality that is restoring them to a proper status in communion.[67]

If innovation is seen as a thing in itself devoid of its own theological critique, it can lead to a destructive utopianism. Those philosophers and theologians who criticise science and technology, confess a nostalgia with respect to "security" and "assurance" in that pre-technological state of affairs in the world which, as it is believed, had been more stable and peaceful, which was not threatened by ecological problems and possible technological disasters, and in which the world seemed to be unchangeable and

[66] (Staniloae 1980, pp. 224, 226).

[67] Compare with a characteristic quotation from J. Zizioulas: "Science and theology for a long time seemed to be in search of different sorts of truth, as if there were not one truth in existence as a whole. This resulted from making truth subject to the dichotomy between the transcendent and the immanent, and in the final analysis from the fact that the "theological" truth and the "scientific" truth were both disconnected from the idea of communion, and were considered in terms of a subject-object framework which was simply the methodology of analytical research ... If theology creatively uses the Greek patristic synthesis concerning truth and communion and applies it courageously to the sphere of the Church, the split between the Church and science can be overcome. The scientist who is a Church member will be able to recognize that he is carrying out a *para-eucharistic work*, and this may lead to the freeing of nature from its subjection beneath the hands of modern technological man" (Zizioulas 1997, pp. 119-120).

"eternal". However, the paradox which is present in this vision is that history itself is abolished because it loses the sense of direction and the goal. The very nostalgic attempt to diminish and ignore the impact of modern science and technology represents an a-historical delusion which, *de facto*, denies the intrinsic teleology which drives science and technology and which ultimately has a human origin. On the other hand, one must admit that scientists, who promote technological progress, themselves do not understand the goals, not saying at all an eschatological meaning of technology.[68] The fear of any teleological connotation in modern science and technology originating in secular presuppositions of scientists creates an obstacle to the sense of *eschatological presence* revealed through exploration of the world and fusion of humanity with the world as its continuing embodiment in it in the conditions of communion with God.[69] In view of this the objective of Christian theology is not to criticise and judge science, but to reveal and revive in its development that sought *eschatological presence* which will allow to a Christian to rethink the meaning of the ambivalence of science and technology in human life, as a mode of suffering, as that struggle for the Divine love, which is always open to humanity in the perspective of the age to come. For an Orthodox Christian, science and technology is that cross of hardship, doubts and contradictions, which one has to carry in order to achieve the perception of the eschatological presence in the passage of modern life.

It follows from what we have just discussed that eschatologism implies transcendence, but not in a sense of futurology (or futuristics), as prognostics of the future from the given present, but as *remembrance of the future*, or, conversely, *anticipation of the past*, by seeing things not through a natural passage of time, but through an anxious expectation of the age to come from where the sense of things, their purposes and ends will shine through. This, by using the words of D. Staniloae, "demonstrates that we cannot understand nature and the meaning of science and technology without recognising a high human destiny, the calling of man to find his fulfilment in God."[70] It is this destiny which safeguards man against all fears of technology: "It is called upon to deliver man from the feeling that he is crushed by

[68] See in this respect a classical paper of M. Heidegger "The Question Concerning Technology" (Heidegger 1977, pp. 3-35). There are some other overtones of this discussion as to whether technology threatens with the overcoming our humanity: see, for example, (Janicaud 2005).

[69] The tragic aspect of being a Christian is to perceive constantly the eschatological presence in the natural conditions where life wants to be happy and comfortable. In a way the very essence of that eschatological presence is to remind us constantly that the goal of our earthly existence is not here and now, not even tomorrow but in the future age. Past, present and what we call stability of tomorrow have meaning in so far they are seen in the perspective of the age to come. All human lives in their contingent historical incarnation can have some deep sense from the perspective of the future. If we "...being Christians prefer the confidence, reliability and security, all these things turn out to be mere illusions and obstacles to the eschatological presence" (Athanasios 2005, p. 61).

[70] (Staniloae 1980, p. 225). Compare with (Clément 1976, pp. 129-130).

technology, just as the Gospel and the teaching of the Fathers delivered him from the feeling that he was at the discretion of certain capricious spiritual beings who made use of nature in an arbitrary way." [71] P. M. Gregorios expressed a similar thought, while reflecting upon patristic heritage: "Man who exercises lordship over creation without reference to his communion with God and to his contingent existence dependent upon God as Creator, is distorted man…Man is not master of the world of his own. He can become truly master of the creation only by being related to the Creator as image of manifest presence. This means that we will need to develop a "science" and "technology" that will keep our relationship with the other pole of our existence – with our Creator and our archetype, God."[72]

Thus one can suggest that technology must be appropriated by Christianity in a different way by subjecting technological development and the alternative futures it suggests to the scrutiny of the transforming presence of the age to come. It is exactly this presence that is missing in all sorts of "end-of-the-world" eschatologies. The eschatological transformation of the attitude to technology implies the transformation of perception of time such that time is not seen any more as unfolding from the past through its branching into alternative futures and carrying with itself all inevitabilities of the present human conditions and lost hopes for physical survival, but, on the contrary, that perception of time which comes from the eschaton, so that the very contemplation of the past is seen now as the specific and concrete anticipation of the future age along the lines of the infinite tasks of humanity. This means that science and technology must be turned towards their proper place in the infinite tasks of humanity and its destiny, rather than to be treated as a part of the process of gradual self-subjugation and adaptation to the necessities of nature (although in its technological extensions). Then and only then the existing schism between theology and science can be overcome by reverting its roots from the historical past, which is haunted by hostility and suspicion, to the common *telos* of theology and science which is inherently present in the core of the human condition and which drives science and theology to the realisation of the destiny of humanity.

The realised eschatology of the science-religion dialogue (as realised innovation) directs attention not so much to the origin of things in the past of the universe and human history, but appeals to treat the origins of things through the *telos* of their explanation, which points towards the age to come. For example, one can be fixed on the idea that there was an evolutionary beginning of all humankind which could potentially

[71] (Staniloae 1980, p. 225).
[72] (Gregorios 1988, p. 225).

"explain" the facticity of the human race. However, by approaching this origin through the humble heart, one could see that phenomenality of this origin will never be disclosed fully to us, but whose incessant presence in our quest for the mystery of our existence, will always form a *telos* of all explanations in an attempt to understand humanity's destiny. A similar thing can be said about the origin of the universe: the so called Big Bang, which is usually depicted as something physically real in the past of the universe, in fact, functions in human consciousness as a *telos* of all cosmological explanations.[73] Cosmology, incapable of explaining the contingency and facticity of the present universe attempts to explain it away by extrapolating all forms of matter and things in the universe back in time to the singular undifferentiated state in which "all was in all", and claims that this primordial, although, non-phenomenal "being", was allegedly responsible for the facticity of everything in the world. However a spiritually attentive intellect directs one to a different treatment of the origins of the universe by pointing out that the comprehension of its givenness through remote consequences is always to be attempted trough the movement of the human knowledge to the future, through the anticipation of the allegedly existent past in the *telos* of all explanations. It is in this theological sense that cosmology loses its sense of an archaeology of the physical universe and acquires more the features of archaeology of the human spirit searching for the ground of its own facticity.[74] What happens here is the combination of our desire to commemorate the past origin of the universe (ανάμνησις) through scientific exploration, with the invocation of the age to come (έπικλησις) which inevitably accompanies that commemoration if it attempts to unfold the mystery of our existence and our destiny in the context of realised eschatological presence.[75] Thus remembrance, past and history are not abolished but rather defined through the invocation of the Holy Spirit which is always an eschatological act. It is here that we see the presence of an intrinsic eucharistic ethos in all modalities of science whose unfolding in history is

[73] See a detailed discussion in (Nesteruk 2015, pp. 334-343, 372-401).

[74] C.f. with a similar stance on the sense of cosmology as disclosed from within human history as thus being the derivative of the latter in (Clément 1976, pp. 80-81).

[75] This situation in modern understanding is similar to that ambivalence which conditioned the thought of the Fathers of the Church who used categories applicable to this world (such as "remembrance") in order to express their perception of the age to come: "remembrance of the future". The culmination of this ethos of the Church as being existence in history but not of history takes place in the celebration of the Liturgy in the invocation of the Kingdom in the anaphora: "Bearing in remembrance, therefore, this commandment of salvation, and all those things which came to pass for us; the Cross, the Grave, the Resurrection on the third day, the Ascension into Heaven, the Sitting on the right hand, the Second and glorious Coming again" (Liturgy of St. John. Chrysostom). Here the suspension of ordinary temporal order takes place which expresses in terms as they are available to humanity the presence of the future age. Contemporary cosmology which unconsciously follows a similar path of anticipation of the pre-temporal past makes effectively a liturgical act of invoking the future age of knowledge of the universe, from which the past and present of the universe will be seen not in sense of construction but rather in a sense of dilation between two parentheses which manifest the alpha and omega of human existence.

driven by its hidden *telos*, whose meaning cannot be known directly, but whose eschatological presence is achieved every time that one invokes the questions about our ultimate origin and destiny. Thus the end of time for which all hope, determines the origin, but not vice versa.

## Conclusion

Contemporary state of affairs in an academic and wider social reality demands from the dialogue between theology and science to take a more radical form aiming to fight the militant atheism and secularism which exploit and misuse results of the scientific progress. The radical theological commitment asserts that the dialogue between theology and science cannot be symmetric and assumes the existence of theological meta-narrative having capacity for critical assessment of modern science. The question of the relevance of the Church tradition and its wisdom in the dialogue with science becomes effectively an apology for their survival in the economically and politically dominated society. Neo-Patristic legacy of G. Florovsky is considered as contributing to the metanarrative of theology and to the task of a defence of Christian values, acquiring a radical dimension of critique of secular culture and science in particular. It characteristically bases its stance on the relevance of experience of God by the Fathers of the early Church, by advocating the restoration of the Divine-given dignity in humanity through communion with God transcending the scope of the natural theology. Any tension between theology and science is destined to disappear if they both are seen as flourishing from the same human experience of existence-communion. Science thus cannot be detached from theology and it is in a complex with theology that it can be properly understood and treated. One sees thus that the *communal* (liturgical) dimension of Greek Patristic synthesis provides us with another methodological rule of mediation between theology and science, namely that this mediation can never be detached from experience of the living God in ecclesial communities. The mediation between theology and science itself thus acquires the features of ecclesial activity. The radicalness of the proposed approach to the dialogue can be supported by the conviction that neither the doctrine of creation nor the doctrine of the Incarnation can allow theology to detach itself from the natural or human sciences studying humanity as set by God to the task of exploring and bringing to word, the order and harmony of the universe. Science regarded this way appears to be a part of humanity's religious duty, as part of its faithful response to the Creator and Sustainer of the Cosmos. Humanity thus exercises communion with the universe through a para-eucharistic employment of science thus contributing to the mediation between theology and science.

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Evagrius Ponticus, *The Prakticos*.

Gregory of Nyssa, St., *On the Making of Man*.

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# EVOLUTIONARY THEORY AND "REVIVAL OF RUSSIA"

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During all years of postsoviet Russia till the present perhaps the most key slogan is "The Revival of Russia". It is repeated almost like a spell by Russian authorities and those who make a politics and are responsible for new Russian idea, national unity and "sovereign democracy". The sense of this slogan is not in its content independently of is there or not any content at all, but in its permanent repeating. When anybody is told day by day about a revival, he can believe that the revival take place indeed. At the same time it is possible to assume that some process called the revival really goes. But then the question is, whether the name of process corresponds to the process itself. Or, perhaps, what is called as revival it would be more correct to call differently?

Of course, there is a lot of answers to this questions including absolutely opposite, and debate on this matter proceeds. The very important aspect of debate is an estimation of the relation between science and religion, and especially the change of this relation, or more correctly, the change of that places which science and religion have now in Russian and that roles which play. Due to a lot of the reasons the relation of the evolutionary theory and religion have an especially important and special significance, and had in each of periods of Russian history of the end of XIXth - the beginning of XXIst century. It came to symbolize the essence of each of these stages of social, political and cultural evolution of Russia and Russians. This in turn influenced social development and thus became highly influential.

## The evolutionary theory and religion in post-Soviet Russia

At the end of the 20th and the beginning of the 21st century religion in Russia is again a public factor, with a particular significance in the national politics of the state and in public consciousness.

According to the data of sociological polls from 60 up to 80 % of the citizens of the Russian Federation claim that they are believers (Religiya 2008). In addition, 68 % of respondents are members of the Russian orthodox church or follow their doctrines (Kaariainen, Furman 2007, 108). However, data like these have to be taken with a grain of salt, as these and many other data of sociological polls received by different sociological services or so called sociological centers vary considerably. What is more, data of official statistics differ frequently and very much from the data of academic and other research institutes and groups. To mention only one example: According to one of sociological polls in 2005 only 16 % of respondents trusted a church – considered it an honest and solid institution –, and about 14 % of respondents trusted the army (Panarin 2005). Therefore almost all such data without any exception require comments, and first of all these comments have to be scientific ones.

In modern Russia, as polls in the 1990s show, only 24,4 % of respondents think that evolutionary theory is proved and 24,0 % of respondents support the "creative" theory, that is so-called "scientific creationism". At the same time 34,5 % of respondents are sure that modern science is not capable to explain the origin of the human species (Byzov 2011).

If these data hold true, why is the positive estimation of evolutionary theory so low? What is the reason of such attitude? Though teaching of the evolutionary theory was considerably reduced in the higher school – reducing the space allotted to it in textsbooks for exsmple –, and even in biological institutes including biological faculties of universities, at present it still remains in the programs of high and secondary school approximately in the same volume. As far as one can tell evolutionary theory is not a subject which is taught badly or as an error of science.

Such mainly neagative attitude to the evolutionary theory in society is a result of persistent efforts of quite certain social forces and groups who try to discredit it and exclude from educational process. For example, in Vertyanov's infamous textbook for 10 — 11 classes of school, in chapter 10 "A hypothesis of evolution and of world creation" it is written that approving "a creation of world Ch. Darwin made mistake only in possible scales of evolutionary process, exaggerated a creative role of natural selection", and the modern evolutionary theory represents only a hypothesis, "a set of the assumptions contradicting each other, and incapable to formulate the main mechanism of evolution"

(Vertyanov 2012, 195-196). Instead of it pupils and students are offered to read "Genesis chapters 1" in which "it is told that the Universe, Earth and everything on it are created by the Creator in six days of creation of the world" (Vertyanov 2012, 192). In chapter 13 "Origin of man" author asserts that "already practically nobody of scientists make attempts to prove so simply an origin of people from monkeys as it was made in the XIX century or even in the seventies of the last century. ... It is absolutely lawful to conclude that monkeys always were monkeys, and people — people! The man didn't descend from an animal. Researches show that he appeared on Earth at once as a human being. ... Being at this obvious deadlock many archeologists, anthropologists, biologists and other scientists began to think about the correctness of theological interpretation of an origin of man" (Vertyanov 2012, 264). In the end of chapter Vertyanov writes that man "first of all is a spiritual being created by God in accordance of God's model, and his main development occurs in an intimate inner world on a way of spiritual improvement and preparation for eternal life" (Vertyanov 2012, 269).

In the summary to the textbook it is told: "The textbook is developed according to modern educational standards and school programs, structurally corresponds to existing textbooks and contains all necessary material for successful examination. Along with the standard material the latest scientific data are given, and the orthodox analysis of a number of questions is given. Both options of an origin of life existing in modern science are considered: in the course of evolution and as a result of creation" (Vertyanov 2012, 2).

The most important factor determining the attitude of a significant part of the population to evolutionary theory and to science as a whole is the mass media. Basically in the mass-media the attitude to the evolutionary theory, to science, and to some Russian scientists and scientific institutes, and the last is especially important for some reasons, is mostly negative (Shevelev 2004; Nauka 2014). The most scandalous example of such attitude became television movie "Diagnostika RAN [Diagnostics of the RAS[1]]" shown on a television channel of REN-TV on September 7, 2013 and right now placed on several websites on the Internet including youtube one.[2] In it some real facts were mixed with conjectures and lie. In modern Russian information space the evolutionary theory and science are "not in honour". It is enough to become familiar with reaction of many mass media to such famous letters in protection of secular character of state education as "The Open letter to Minister of a science and education of the Russian Federation", and "The Open letters" by "ten" and by "thousand" to the president of the

[1] Russian Academy of Sciences.
[2] // http://www.youtube.com/watch?v=sgCunFgFS_c

Russian Federation (Al'ternativa 2007). Authors of all three letters appealed to preserve the secular character of state education in schools and universities and especially preserve evolution theory as the extremely important element of education. The last letter was also a direct reaction to the so called "The letter of 227" in which the president of the Russian Federation was asked emphatically to assist the introduction of "Fundamentals of the Orthodox culture" in school program (Obrashenie 2009). The titles of articles in "Big" mass-media devoted to these letters are very demonstrative and do not need any comments. For example: "Famous journalists have condemned the antichurch letter of ten academicians" (Lipich 2007a), "On academic anticlericalism" (Privalov 2007), "On the occasion of the letter of ten" (Legoda 2007), "Defenders of human rights create a basis for new persecutions of Church" (Lipich 2007b), "Protests against "Fundamentals of orthodox culture" are anticonstitutional" (Protests 2007), "Appeals to limit an activity of Church to frameworks of district is the rudiment of the ideology of political pensioners" (Prizyvy 2007), "Academicians and clericals battle for souls" (Silachev 2007). Thus one strain in the Russian public is bent on persevering efforts to discredit the evolutionary theory and to exclude it from schools and universities. These efforts of various social groups or forces are supported sometimes indirectly and more frequently openly but anyway permanently by the so-called Russian political elite and, accordingly, the state. It is obvious that this is not accidental but rather a general tendency in the attempt to use religion according to their goals.

The continued publication history of Darwin's "The Origin of species" in Soviet and post-Soviet periods corroborates this trend (Konashev, Polevoi 2010, 35-37). During the Soviet period "The Origin of species" has been published seven times, twice in collected works (Darwin 1925; 1939). In the post-Soviet period the book was published only twice, and both times already in 21st century. In 2001 the best soviet edition of 1991 was reprinted with a few new comments (Darwin 2001), and in 2003 the translation of Darwin's book edited by Kliment Arkadievich Timiryazev (1843-1920) in 1907 was republished (Darwin 2003). However, the quality of this last edition falls behind that not only of the editions in 1991 and 2001, but also to the initial 1907 edition.

Whereas some 30,000 to 35,000 copies of the translated "Origin" were issued in Tsarist times, the four editions of the early Soviet period from 1926 till 1937 sold as many as 79,200 copies, more than twice the tsarist circulation (Ot redaktsii 1939, II). The edition of "The Origin of species" published especially for teachers in 1987 had a circulation of 135,000 copies. The edition which was published in 1991 that is just at the very end of so called "perestroika" had a circulation of 11,000 copies. This was considerably less in comparison to circulations in Soviet times, but still exceeded

individual editions of tsarist times. The second edition of the same translation prepared by the same collective of authors and published ten years later in 2001, had already circulation only of 1,000 copies which is a standard "very good" circulation for any scientific book of post-Soviet period. At last, the edition of 2003 also has had a circulation of 1,000 copies (Konashev, Polevoi 2009, 34-35).

Certainly, the general tendency of the attitude to the evolutionary theory in the Russian information space and society is only the result, the main vector of interaction and sometimes of fights of various public, sociopolitical, ideological and cultural forces and figures. To describe briefly positions only some of these forces which are the most important in the given situation: No doubt the position of the scientific community is paramount. Their position is ambiguous and heterogeneous, but the basic line of "demarcation" is determined mainly by the proximity or distance between the professional sphere of activity of the respective scientists and evolutionary biology. Whereas scientists (biologists, geologists, physicists, chemists, etc.) basically estimate positively an evolutionary theory, support the secular character of education and are against the introduction of any teaching of religious outlook in high school, people with a background in the humanities, especially lawyers and linguists, tend to take the opposite position (see tables 1-5). Among those 227 who signed the letter to the president of the Russian Federation – supported the teaching of religion in schools and scientific degrees of theology in universities – a quarter of the signatories had a humanities background, nearly 19 % a (natural) science background, 18% were mathematicians, physicists or engineers (exact sciences) background (see table 5). Thus among representatives of humanites are more whose who against evolutionary theory and for religious education in schools and theology in universities. The coincidence of these data and data on the support of the other letter to the president of the Russian Federation, the so-called letter of 227, is very telling (see table 4-5). Most of these 227 are those with an education in the humanities, not in so called exact sciences like physics, chemistry or biology.

At the same time Russian scientific community can be considered as an independent and important public force only with great reserve. The scientific community seems absent notably from the Russian information space, mostly in russian mass media but in fact it transmits information into the general public via two newspapers, "Poisk" (issued since 2010) that means "The Search" and "Troitskii variant" that means "Troitsky variant" (issued since 2008). The first one is published by the Presidium of Russian Academy of sciences, the second by a group of scientists from

Troitsk – a small scientific centre near Moscow. Both provide an online version[3] and try to present science positively and to discuss honestly real problems of science. But in so called "big press" science and scientists are frequently represented in a comical and even satirical form, or in best case from so called objective position.

In society at large, the so-called 'political elite' and the Church are the dominant forces. In consequence, they are most powerfully presented in Russian information space (Konashev 2008, 49-51). The attitude of the churches, first of all, of Russian orthodox church to the evolutionary theory is bluntly negative – almost all, including the Islamic ones, churches in Russia oppose evolutionary theory –, though official representatives of the church and its ideologists in every possible way emphasize compatibility of orthodox religion and science. This tolerance may be due to the policy of the Orthodox Church to become the sole factor on religious matters in the country. "The political elite", and, hence, the state take an outwardly neutral position, but in practice support church expansion and to form strong alliance with it. Such policy has the strong reasons and is a part of more the general policy of restoration of capitalism. One of the overall aims of this policy consists in the achievement, and "once and for ever" of so called "the point of a non-return" to a state similar to the Soviet past. It means to exclude absolutely the very opportunity of formation again of any kind of socialism in Russia. Therefore this policy is naturally and inevitably an anti-communist and anti-soviet one, directed towards complete discrediting of the Soviet past and presenting it as an absolutely evil period.

In other words, a full refusal of "the Soviet Utopia" and "the Soviet myth" according to this logic entails a refutation of the evolutionary theory, or, at least, its herding into the narrow field of "pure" science – that tiny, microscopic enclave where even existence of scientific research at a modern level without the evolutionary theory simply is impossible – almost unknown to anybody outside biology.

This basic dependence of many modern researches on the theory of evolution has been demonstrated well in the documentary of the BBC originally called Evolution, shown on TV in Russia under the Russian title "The Dangerous idea of Darwin". It is a co-production of the WGBH/NOVA Science Unit and Clear Blue Sky Productions, 2001) devoted to Darwin's theory of evolution and shown at the all-Russian telechannel "Kultura" (that is "Culture") on November, 14-15, 2007. It was shown that many discoveries in modern pharmacy and medicine would be impossuble without such research basis as an evolutionary theory. The same antisocialist logic with necessity has demanded not simply returning to some of the long forgotten old orders and traditions

[3] Detailed information on the webpage, URL: http://www.poisknews.ru/index.php; http://scientific.ru/trv/

of tsarist Russia, but to surpass them, to make them stronger and more solid in order to stabilize and more firmly establish the new political regime. Necessity of such approach has been expressed, for example, in the following original manner: "Only creation of informational 'special troops' will allow Russia to avoid the hugest losses and not to repeat mistakes of 1914-1917" (Panarin, Panarina 2003. 3). Thus an attempt to revive the old and bankrupt slogan of imperial Russia – "autocracy, Orthodoxy and national character", - has been made (Babichenko 2007; Bur'yanov 2001).

Today, there is another important force in addition to the political elite and the Church, according to the already forgotten, but exact definition by Yurii Nikolaevich Afanas'ev (born 1934), "the aggressive – obedient majority" of the population. In comparison with previous two sociopolitical groups "the aggressive – obedient majority" is passive in social and informational relations. One can say this group is almost entirely the object, instead of the subject, of social and informational action. This group, that is a great bulk of citizens, has no means of manufacturing and distributing information. It is only the receiver, the consumer of the information which is delivered by other, more active sociopolitical groups. Therefore it is not only the object of struggle for social, political, and, first of all informational influence. Much more it is such obedient part of a society which is conducted in necessary direction at least partly.

At the same time this group is, at least potentially, and in the certain situations also actually, an aggressive part of society. Of course it is not and cannot be the most aggressive. But its aggressive potential can be used easily by very aggressive and very different small social and ideological groups such as nationalistic groups who fear Russia being sold out to Western capitalists by a thin powerful and immensely wealthy elite. There are many examples of such behavior at least in Russia: "ethnic slaughter" in the town of the Republic of Karelia, Kondopoga, murders of students from Africa, endless clashes and brawls in public places, including a municipal transport. There is also a number of 'minor' incidents not deemed worth mentioning in the press. In particular, one of such facts is the support of right orthodox radicals who demand to *interdict* the teaching of the evolutionary theory in schools by the significant part of participants of sociological questioning. Though at present 69.5 % of Russians are still against any restrictions in teaching the evolutionary theory and propagation of a natural origin of man, 20,4 % of Russians are already against teaching of Darwinism at school. And 17,3 % of Russians believe that it is necessary to limit strongly teaching of Darwinism. 7,3 %, of Russians support an unconditional exception of the evolutionary theory of Ch. Darwin of school textbooks. At last, "the most radical part of the Russian society which consist of 4,8 % even demands to put an interdiction right up to a criminal

sanction for distribution of such 'vicious', in their opinion, theory as Darwinism" (Byzov 2011). Under these conditions the first "monkey trial" in Russia naturally became a widely reported event. Owing to the advocates of expelling evolution from schools – who argue on the basis of a country returning to former glory – Russia has received ill fame abroad (Levit, Hossfeld, and Olsson 2007). These first sparks of a new crusade are the direct consequence of long post-Soviet information influence of the collaboration of church (all churches) and the state in Russia. In the "Social doctrine" accepted several years ago Russian orthodox church has condemned some doctrines and social phenomena, called to their restriction and even eradication, and put forward in a counterbalance of Darwin's theory, the "creative" theory according to which man has been created by the God in "the seventh day of creation" (Byzov 2011).

"The aggressive – obedient majority" shows a high degree of aggression too in relation to other "hostile", not Christian values and their carriers, in particular to atheists, secular humanists, communists and other "evil spirits". In 2005 the essential part of respondents, 36 % supported an interdiction of public statements against religion; 17 % insisted that opponents of belief were not to be allowed to teach at universities and 22 % demanded that the books written by "atheists" were to be withdrawn from libraries (Kaariainen, Furman, 2007, 109). In Russia it has begun to smell of fires of the inquisition and there are first signs of its more soft form, i.e. religious censorship. Referring to the high percentage of believers among the population, the active right radical part of orthodoxy demands special privileges for the so called "title religion" – i.e. the main, traditional form supported by the majority – and to bring some norms of a public life and state system into accord with "Christian values". In particular, orthodox radicals press for renaming of streets, underground stations, cities, and so on. For example, they demand to rename Leningrad railway station in Moscow into Nikolaevsky railway station in honour of tsar Nikolai II (Romanov Nikolai Aleksandrovich, 1868-1918).

Thus, there has been a kind of information civil war in Russian society for some time now (Konashev 2008, 51-53). In this information war "victory" over evolutionary theory plays an important role. In fact the reappraisal of all values which is being accomplished during all of the post-Soviet period of Russian history includes the reappraisal of evolutionary theory and evolutionary outlook. That is why the attitude to the theory of biological evolution in Russia is one of the most typical and symbolic cultural and ideological results of the post-Soviet transformation and "modernization" of Russia (Cohen 2000, 159).

If on the initial reception of Darwin's evolutionary theory and its development tsarist Russia was in the front line of the most advanced countries of that time, including Darwin's native land Great Britain, the "revived" and again "found" Russia of neocapitalism, neoliberalism and neoclericalism has undoubtedly surpassed in anti-evolutionary campaign of all those from whom more recently it tried, at least in words, to follow an example. At the end of the 20th and beginning of the 21st century, an original avantgarde of fighters against of the evolutionary theory appeared in Russia, its violent exposers and prosecutors, being ahead of France which took place in opposition to this theory during long time in past, and the USA which is the stronghold and center of "scientific creationism" (Numbers 2006; Witham 2002). The role of the main exposer and prosecutor has been voluntary undertaken by Russian Orthodox church, its former leader, Alex II, the Most holy Patriarch Moscow and all Russia, declared the following: "Comprehension by man, that he is a wreath of God's creation, - only ennobles him, and if somebody wants to think that he has originated from the monkey - let them do so, but do not impose these views on others" (Salunova 2007). The new chief of the Russian Orthodox church, Patriarch Cyril, abstains from similar statements, but the general line of the union with the state and the largest business and forced clericalisation has not changed. Being the head of the Department of external church connections of the Moscow patriarchy, Cyril insists that to leave the Russian Orthodox Church "isolated" from Russian society would mean to refuse "the mission of transformation of a society" (Nikakoi 2007). Thus, the supertask of the Russian Orthodox church is at least to assign to itself that place and function which the ideological apparatus of the Central Committee of the Communist party of the Soviet Union and some departments of this committee had in a society of "real socialism". Finally this supertask consists in that henceforth and forever and ever, to determine "a general line" of the development of Russia and to stop any possible or probable deviations from this line. Certainly, as in the Communist party of the Soviet Union where "the general line" was determined really by "an internal party" George Orwell, and even only by "the first circle" of this "internal party", as in modern Russian "party in power" similar "general line" is determined "the first circle" of it and, of course, top leaders of Russian orthodox church belong to this circle.

The reasons for such state and church joint policy are in previous history of the country.

## The evolutionary theory and religion in tsarist Russia

Translations of Darwin's *The Origin of Species* and his probably even more controversial book *The Descent of Man* were published in Tsarist Russia without any obstacles or interventions of censorship, in 1864, 1865, 1873, 1896 and 1907 respectively. Partly this can be explained by some features of "Temporary rules for censorship and the press" of 1865. As earlier fears of revolutions, which had swept across many parts of Europe in the 1840s had decreased, and as certain liberties were allowed to the educated strata of the Russian society, translations of Darwin's writings seemed to pose no threat. More importantly, perhaps, officials naively (as it became obvious later) believed that only few very educated citizens were interested in scientific books and this is not dangerous for the Russian Empire.

However, even in England Darwin for the sake of promotion and statements of his evolutionary theory both in scientific community itself, and in more broad audiences of the reading public, have been compelled to resort to self-censorship. In Russia, the censorship of those books and articles, in which Darwin's theory was popularly stated to a non-scientific audience, was far-reaching and all-encompassing in character (Kharakhorkin 1960). Why so? In the opinion of censors and the authority, popularization of Darwin's scientific works, undoubtedly, was directed against truth of Christian belief in general, and the doctrines and values of the Russian orthodox church in particular. Certainly, censors cared also of public morals as a whole and preservation of family foundations in particular. In other words the attitude of the government to the evolutionary theory of Darwin was ambivalent. On the one hand, it could be presented in scientific sphere and even in higher education, but on the other hand its popularization among "common people" was purposely limited in every possible way and not without any reasons. This thin and at the same time very rigid distinction between legal and unlawful concerning the evolutionary theory in late tsarist Russia has later precisely been defined by Jurii Ivanovich Polyansky (1904-1993) who was one of the famous biologists protozoologist and evolutionist of the Soviet years (Kolchinsky 2011). He was born in 1904 in Saint-Petersburg into a family of the intellectuals. His father, Ivan Ivanovich Polyansky (1872-1930) was an outstanding biologist, professor at St. Petersburg University and an important figure of education (Samokish 2011). According to Jurii Polyansky, evolutionary theory enjoyed some freedom of thought in the public in late Tsarist Russia:

"As to up to freedom of statements, say, to protect the Darwinian theory of evolution it was possible to do this completely easy. Nobody did force you to pray

necessarily to the God. But, of course, if you have directly acted against a regime and so on, and so forth, hardly it would cause approval". (2005, 114).

In fact, it was indeed possible to debate evolution and teach it at the end of 19th and the beginning of 20th century quite freely, but only in universities, and not in schools.

Between 1864 and 1917 Darwin's *Origin of species* was published more than ten times in different translations and editions (Konashev, Polevoi 2009, 30). The first translation was Sergei A. Rachinsky's (1836-1902) (Darwin 1864), who most likely translated the text of the second American edition with using of German one (Chajkovsky 1984). After that evolution quickly made its way into publications of various formats for the educated, when, for instance, long articles devoted to this theory were included practically in all Russian encyclopedias and other dictionaries of encyclopaedic character. The unconditional celebration of the theory of Darwin in Russia, anyway, in encyclopaedic editions, was expressed in a fact that in all editions of the encyclopaedic dictionary of Florentii Fedorowitsch Pavlenkov (1839-1900) – issued before 1917 – it was stated that the Darwinian theory of the origin of species "is shared now almost by all naturalists" (Entsiklopedicheskii 1913, 634). On the whole one can say that the saying, Russia by the beginning of 20th-century Russia had become the second native land of Darwinism, is indeed true (Georgievskii, Khakhina 1996, 9).

At the same time, in Russia there was undoubtedly enough strong cohort of opponents of Darwin's evolutionary theory which as well as in other countries consisted basically in representatives of religious circles. They found, at least, understanding, sympathy and active support at least in parts of the autocratic state, most notably in the top rungs of bureaucracy and secretaries of state. Following some English contemporaries of Darwin who had no doubts that Darwin was an atheist and his evolutionary theory was simply the scientific justification for elimination of the God, i.e. for atheism and consequently considering it as socially dangerous (See, for example: Lutard 1892), Russian pre-revolutionary publicists and religious figures also wrote about Darwin's theory as the scientific justification of atheism. For example, Nikolai Jakolewitsch Danilevsky (1822-1885) insisted that the evolutionary theory of Darwin is incompatible with religion as it has obviously atheistic character, and it will "change, and will overturn not only our ordinary and our scientific biological sights and axioms, and together with it change all our outlook up to the very root and the basis" (Danilevskii 1885, 6). A famous professor of Moscow University, Aleksandr Andreevich Tikhomirov (1850-1931), called Darwinism the most anti-Christian doctrine which had

abolished the basis of the Christian view of nature – the idea of the order pre-established in the world and of the absolutely special position of man among other terrestrial beings. Tikhomirov asserted that Darwin had lifted the weapon against Christianity and called this his biggest fault (Tikhomirov 1907). Nevertheless, relative independence of the Russian universities in a combination with free-thinking of many scientists allowed for enough room for a relative freedom of science. During this era, serious and strong discontent of the Church with the spread of evolutionary theory did never reach as far as a direct interdiction of evolutionary courses and textbooks at universities. In fact, statements of church officials against Darwinism were rather soft, as they never really delved deep into the theory's specifics. For example, they criticized the expression and concept of a 'struggle for existence' or a 'selection', to them clear refutations of Christian doctrines that the world is basically a peaceful place created by God for humanity (Georgievskii, Khakhina 1996, 212). There was no direct clash between Darwinism and the orthodox Church in Tsarist Russia. Therefore, the main feature of "mutual relations of evolutionism and religion in Russia consisted in the absence of open confrontation between them which would lead to rigid counteraction to development of scientific idea" (Georgievskii, Khakhina 1996, 147).

## The evolutionary theory and religion in the USSR

During almost all 70 years of the existence of the Soviet Union its supporters and, that is more important, its most irreconcilable opponents, recognized that science played a great role in the Soviet society. The Soviet state always supported and promoted science, even in the most difficult years, such as the civil war of 1918-20 and Great patriotic war 1941-1945 (See, for example: Bastrakova 1973; Berlyavskii 2004; Nauka 2006). As a result science had a general respect in the Soviet society, its authority was sometimes higher than authority of the power, and aspiration for true scientific knowledge was inherent in the widest groups of people. Such estimation is given, for example, in a number of articles of the Russian emigrant, then American citizen, world famous geneticist and evolutionist Theodosius Dobzhansky (See, for example: Dobzhansky 1952, 40; 1953, 1; 1955, 329).

Despite all this backing by the state, the situation of Soviet science was inhibited, since its actors were constantly under the rigid control of party-state machinery or, according to other terminology, the Soviet nomenclature. Which of the sciences were held up most, which scholars were funded most lavishly, which theories were accepted: all these matters were first and foremost state matters, not science matters. Science was controlled and ruled not by scientists themselves, but mostly by party and state

authorities. Whose theory or research found favour with the authorities depended on the party doctrine valid at a given time. Science went through all the changes overall society experienced: from revolution and post-revolution 1920th, through Stalinism, Khrushev's "thaw" and "stagnation" of Brezhnev's period to "perestroika" revived people hopes and, at last, to the "temple" of the capitalist restoration which has brought for the country the bigger losses than Stalinism, e.g. the closing down of many scientific institutions (See, for example: Bykov, Konashev 2006). In addition, scholars were subject to mass repressions just like the whole country was, as for example in the 1930th. Nevertheless, on the eve of neo-liberal "liberation" of the country of "communistic totalitarianism", both the Soviet science, and system of free-of-charge education closely connected to it with a special subsystem of search, encouragement and cultivation of the talents, including school for especially gifted children, school Olympiads and student's scientific circles and societies, still were among the most efficient in the world. The evolutionary theory was, without any doubt, important and one of corner elements of a science and the whole, not only biological education, in practice being an axial core of really scientific outlook (See, for example: Fesenkova 2003).

During the Soviet period, religion as a public phenomenon and the Church as an institution were considered by the Communist authorities as something that inevitably should disappear, and die naturally itself in the process of strengthening a new socialist society. Therefore religion was tolerated as a certain atavism inherited from the capitalist past. Because of this the attitude of believers and church to the evolutionary theory had practically no meaning. To be a religious person at this time was nothing to be discussed openly. Attitudes towards believers ranged from indifference to contempt, with contempt being fairly rare, and tacit permission to keep to one's beliefs was the rule. When the part of an oppositional intelligentsia began to be fond of religion mainly as the protest against barracks regulation and a stagnant intellectual atmosphere, this captious attitude was not extended to include evolutionary theory (Konashev 2011, 185). Partly because the evolutionary theory, namely "the synthetic theory of evolution" or "Darwinism in the 20th century" has been connected to genetics, and so was in some disgrace or to some degree under suspicion and, at least, caused the certain mistrust. Therefore, on the contrary, a support of "the synthetic theory of evolution" was the certain demonstration of oppositionness too and demanded some civic courage. The second name of this theory in the USSR, "Darwinism in 20th century" (Mednikov 1975), was chosen specially to emphasize its Darwinian character. Thus one could provide it by powerful ideological protection as in due time classics of marxism have named Ch.

Darwin's evolutionary doctrine a natural-science confirmation of their views, and this statement was included in many texts of the official marxism – leninism, glossaries and educational texts including different textbooks (See, for example: Obshajya 1970, 55; Obshajya 1984, 292). In some of them there was special paragraph on scientific prerequisites for Marxism or Marxist philosophy (See, for example: Dialekticheskii 1985, 42-43).

The subsequent stratification and delimitation of oppositional groups of society, so-called dissidents (See, for example: Medvedev, Medvedev 2010, 267-275, 287-350) did not change this attitude to evolutionary theory. Moreover, when the significant part of the Soviet intelligentsia in particular close to the nomenclature, having been disappointed in "real socialism", has chosen "the western way of life" as an ideal, this choice, for many meaning a specific return to religion, its recognition as a spiritual value, also was not accompanied by the negative attitude to the evolutionary theory which in their eyes was a part of "the western way of life", of western freedom and democracy.

Despite post-Soviet rhetoric about a Soviet war on the Churches and purposeful policy of repression of believers, including the newest statements and even charges in systematic and total, purposeful destruction of religion and church in the USSR, in reality the Soviet past was more lenient. Besides even many facts of post-Soviet reality contradict these conclusions. Had there truly been 70 years of "systematic and purposeful destruction" of the Russian orthodox church, hardly any traces or structures would have been left. The fact that it expanded very quickly after the end of Soviet socialism and became a very influential force in the new, post-Soviet state, even more influential than in tsarist Russia, indicates something quite different. During these 70 years there were some periods in which the attitude of the state towards the church varied. For instance, during late stalinism the power including Stalin personally rather favourably inclined towards the church, and the Russian orthodox church quite certainly benefitted from this relatively exclusive position (Shkarovsky 2005, 286-305). Some repressions which took place in relation to believers, basically during the Great Terror, much more conceded to repressions against non-believers, first of all against "Lenin's guards" which were indeed total and purposeful. Thus these repressions of believers had no specifically antichurch and, especially, antireligious character. They were simply a part of the Great Terror, the nature and sense of which hotly argue till now, and not only in Russia. Besides many geneticists and evolutionists were also subjected to repression, in particular Nikolai Ivanovich Vavilov (1887-1943) and Nikolai Ivanovich Buharin (1888-1938) who was not only politician, but a scientist (economist) too, and

who, long before George Gaylord Simpson (1902-1984), had suggested the term "synthetic theory of evolution".

It can be added that even those young Soviet believers who chose a scientific career, became sincere and convinced evolutionists. Moreover, they have remained those in the post-Soviet epoch (Konashev 2011, P. 167-176).

## The evolutionary theory and religion in Russia in the near future

Possible variants of changes of the attitude in Russia to the evolutionary theory and religion depend on what will be the further evolution of Russia and what from available tendencies of development will be prevailing. Russian restored capitalism has a number of important features, common with the same restored capitalism in East-European countries. This new old Russian capitalism has also some specific features distinguishing it both from East-European capitalism of a "peripheral" sample, and from capitalism of the centre or so called "civilized" capitalism (See, for example: Davydov 1991; Prebish 1992; Yavlinskii 2003). Usually Western Europe and the USA are considered, and not only in Russia, as such capitalism of the centre.

One of the most essential features of modern Russian capitalism is that at the basis of the information split of the Russian society there is undoubtedly a social, economic and political disunity of society. A lot of the data and parameters confirm this observation. One of the most frequently cited is the level or coefficient of differentiation of incomes of the population. The given parameter evidently and precisely characterizes a degree of social stratification and is defined as a ratio between average levels of incomes of 10 % of the population with the highest incomes and 10 % of the population with the lowest incomes. For the post-Soviet period of Russian history from 1992 to 2006, it has got the tendency to grow steadily. In 2006 incomes of the richest part of population more than in 15 times have exceeded incomes of the least rich. And, in 2006 according to an official statistics 20 % of the richest citizens have had 46,8 % of the national income, and 20 % of the poorest have had only 5,4 % (Anisimova 2009, 215). The divide between the rich and the poor is rapidly widening and directly correlating with the decline of education and the grow of church power.

Besides it has to be said that all reforms of the post-Soviet period could not change this widening with notable effects on public opinion. First of all, privatization is still not approved by the majority of Russians according to numerous sociological polls of various years. For example, the data of sociological centre "Public opinion" confirm that almost two thirds of Russians (64 %) still think that privatization transactions were realized in most cases with infringement of the law, and only 9 % believe that they were

realized according to the law. Only 16 % of respondents are sure that the privatized enterprises work better than enterprises which are remained in the property of the state. The majority is also sure that as a whole the privatization has brought to the country more harm than benefit (Dolmatova 2009, 212). Thus the so called neo-conservative as well as previos neo-liberal policy and ideology of Russian ruling elite is not supported by the majority of people in Russia (Slavin 2014, 84).

Putin's neo-conservatism is an artificial product of political technologists who served the ruling elite and is a compelled compromise as well as the whole Putin's inner policy. According to some authors the probable result of this policy will be a deadlock at best (Chuikov 2015). At the worst under some circumstances this policy instead of preventing social and political explosion can end in coup d'etat, perhaps, in the form of "color revolution", or, on the contrary, in real revolution (Rozhin 2015), the event which the ruling elite is afraid most of all. It is obvious that though ruling elite and personally Putin try to keep balance of forces (in own favor, of course) in ruling elite between those whom call by neokonseratvor and westernized liberals, avoiding to make a final and unambiguous choice between these forces and stopping according to Putin the arising threats in the elite and in a people at large, sooner or later this choice should be made. Otherwise the choice will be made by others as well as in 1917. Owing to a number of the geopolitical and internal reasons among which on the first place is the deterioration of relations with the West because of support of rebellious Novorossiya in Ukraine and Syria in the Middle East the probable and inevitable moment for this choice can comes very soon.

In these conditions the restoration of former mostly positive attitude to the evolutionary theory and, even more so, the development of new evolutionary culture is impossible without the solid modernization and democratization of Russia. At present there are some alternative ways of such modernization and some competing projects of its realization. The spectrum of these projects of new modernized Russia is great enough and various. In it alongside with such traditional projects as the project of the rights, the project of patriots, the liberal project, the orthodox project, the project of "party in power" and the "communistic" project of the Zyuganov's party, the Communist party of Russian Federation, there is also the neo-communistic or neo-socialist project of the new lefts. According to this project of new Russian lefts the revival and prosperity of the Russian society can be achieved only through a post-capitalist, meaning neocommunist revival, which they see as part of a global socialist Renaissance. The future debate between evolution and religion in Russia will depend on the outcome of this rivaling between movements and their visions of the Russian society to come.

**Table 1 (**Borkin, Ermolaev, Konashev 2008, 237**)**

Geographical distribution of those scientists who has signed *The Open letter to Minister of a science and education of the Russian Federation:* The main cities and regions.

| Region | Quantity of signatures | Percent |
|---|---|---|
| Saint Petersburg and Leningrad region | 145 | 42.5 |
| Moscow and the Moscow area | 58 | 17.0 |
| Kazan and Republic Tatarstan as a whole | 18 | 5.3 |
| Tyumen and the Tyumen area | 13 | 3.8 |
| Vladivostok | 5 | 1.6 |
| Saratov | 5 | 1.5 |
| Ekaterinburg | 4 | 1.2 |
| Izhevsk and Udmurtiya as a whole | 4 | 1.2 |
| Magadan | 4 | 1.2 |
| Novosibirsk | 4 | 1.2 |
| Penza and the Penza area | 4 | 1.2 |
| **Total:** | 341 | 100 |

**Table 2 (**Borkin, Ermolaev, Konashev 2008, 238**)**

Statistics of specialties of those scientists who has signed *The Open letter to Minister of a science and education of the Russian Federation*

| Specialty | Quantity | % |
|---|---|---|
| Humanitarian and social sciences | 43 | 26.2 |
| Natural sciences | 31 | 18.9 |
| Exact sciences (mathematics, physics, mechanics) | 30 | 18.3 |
| Writers, workers of publishing houses and mass-media | 23 | 14.0 |
| Schoolboys | 15 | 9.1 |
| Students | 9 | 5.5 |
| Physicians | 7 | 4.1 |
| Teachers | 6 | 3.4 |
| **Total:** | 164 | 100 |

**Table 3 (**Borkin, Ermolaev, Konashev 2008, 239**)**

Distribution scientists who has signed *The Open letter to Minister of a science and education of the Russian Federation* on scientific degrees

| **Scientific degree** | **Sciences** | **Quantity** | **%** |
|---|---|---|---|
| *Candidates of sciences* | *In total* | *53* | *51.0* |
| *Doctors of sciences* | *In total* | *48* | *46.1* |
| From them | Biological sciences | 13 | 27 |
| | Philosophical | 11 | 23 |
| | Physical and mathematical | 5 | 10 |
| | Historical | 4 | 8 |
| | Chemical | 3 | 6 |
| | Philological | 3 | 6 |
| | Technical | 2 | 4 |
| | Political | 2 | 4 |
| | Geographical | 1 | 2 |
| | Psychological | 1 | 2 |
| | Pedagogical | 1 | 2 |
| | Medical | 1 | 2 |
| | Economic | 1 | 2 |
| *Members of the Russian Academy of Science (academicians and members - correspondents)* | *In total* | *3* | *2.9* |
| ***Total*** | *In total* | *104* | *100* |

**Table 4 (**Otkrytoe 2008, 2).

The Letter of scientists to the President of the Russian Federation with the protest against introduction of teaching of religion in schools and scientific degrees on theology in universities ("The letter of thousand") and for the introduction ("The letter of 227").

**The distribution on cities**

| | **The letter of thousand** | **The letter of 227** |
|---|---|---|
| Cities | Quantity | Quantity |
| Moscow | 392 | 128 |
| Sain-Petersburg | 170 | 28 |
| Novosibirsk | 88 | |
| Ekaterinburg | 37 | |
| Irkutsk | 32 | |
| Nizhni Novgorod | 17 | |
| Pushino, Moscow region | 16 | |
| Vladivostok | 13 | |
| Izhevsk | 13 | |
| Troitsk, Moscow region | 12 | |
| Voronezh | 10 | |
| Vladivostok | 13 | |
| Krasnoyarsk | 13 | |
| Rostov-on-Don | 9 | |
| Tumen' | 8 | |
| Kazan | 6 | |
| Nizhnii Arhyz, Karachaevo- Circassian | 6 | |
| Syktyvkar | 6 | |
| Kursk, Ulyanovsk | | in 2 |
| Ryazan and other 7 towns | | in 1 |

**Table 5 (**Otkrytoe 2008, 2).

The Letter of scientists to the President of the Russian Federation with the protest against introduction of teaching of religion in schools and scientific degrees on theology in universities ("The letter of thousand") and for the introduction ("The letter of 227"). The distribution on specialities and on degrees

| | **"The letter of thousand"** | | | **"The letter of 227"** | | |
|---|---|---|---|---|---|---|
| **Sciences** | **Doctors of sciences** | **Candidates of sciences** | **Total** | **Doctors of sciences** | **Candidates of sciences** | **Total** |
| Physical and mathematical | 153 | 225 | **378** | 14 | 26 | **40** |
| Biological | 79 | 176 | 255 | 2 | 3 | 5 |
| Philological | 8 | 31 | 39 | 15 | 35 | 50 |
| Technical | 18 | 46 | 64 | 1 | 2 | 3 |
| Philosophical | 21 | 27 | 48 | 8 | 8 | 16 |
| Chemical | 15 | 44 | 59 | 0 | 1 | 1 |
| Historical | 4 | 23 | 27 | 5 | 17 | 22 |
| Pedagogical | 1 | 13 | 14 | 5 | 22 | 27 |
| Jurisprudence | 0 | 6 | 6 | 17 | 18 | 35 |
| Geological and mineralogical | 4 | 29 | 33 | 0 | 1 | 1 |
| Economic | 5 | 18 | 23 | 2 | 3 | 5 |
| Medical | 5 | 13 | 18 | 1 | 1 | 2 |
| Psychological | 4 | 3 | 7 | 6 | 2 | 8 |
| Geographical | 1 | 5 | 6 | 1 | 1 | 2 |
| Sociological | 3 | 0 | 3 | 0 | 2 | 2 |
| Politology | 1 | 2 | 3 | 0 | 1 | 1 |
| Art criticism | 2 | 1 | 3 | 0 | 0 | 0 |
| Militarians | 0 | 1 | 1 | 0 | 2 | 2 |
| Cultural science | 0 | 1 | 1 | 0 | 2 | 2 |
| Agricultural | 0 | 2 | 2 | 0 | 0 | 0 |
| Architecture | 0 | 0 | 0 | 0 | 1 | 1 |
| **Total** | **324** | **666** | **1029** | **77** | **148** | **–** |

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# 2. EASTERN CHRISTIANITY

# THE PENDULUM OF PHILOPONOS: NATURAL PHILOSOPHY BETWEEN SCIENCE AND RELIGION IN THE 6TH CENTURY AD

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## The era and the author

Ioannes Philoponos lived in Alexandria during the 6th century AD, at the end of the Late Antiquity. He studied at the School of Alexandria at the time of Ammonios' leadership of the school. At that period, Philosophy, as it was presented in Classical Era, had lost its role which had achieved in earlier times regarding the evolution of ideas. A particular method of thinking consisted of animism and metaphysics was arisen: Philosophical ideas, after the splendor of the Hellenistic Era, seemed to be described by a long-lasting shortage of creative conclusions. During the next 2 centuries, it seems that neither major issues were searched nor innovative ideas were proposed. Those were the centuries which Christendom was established as the official religion of the eastern Roman Empire and inspired every spiritual movement in those territories. On the other hand, Christianity determined the entity of Knowledge through the Holy Fathers' tutorship. Therefore, a gradual reduction of the role of Philosophy as a methodological approach for natural processes can be notified at that period as clergymen were afraid that such activities could bring on digression from the moral principles of the new religion. Only a few cases of such activities were undertaken and natural processes were considered to be representations and appearances of ethical principles.

Philoponos was probably a christian by birth or became christian in his early life, having in mind that his first name was "Ioannes". He wrote a series of long commentaries on Aristotle's works as well as essays against heretical writers. Philoponos himself was influenced by Monophysists and had relations with Sergios, Patriarch of Antioch.

It remains opened as a question if he had composed his commentaries inspired by christian or neoplatonic principles[1]. However, at the school of Alexandria, scholars had tried to conjunct Hellenic philosophical tradition with Christian principles and helped them to keep up the school active during that riotous period when Athens' school was closed at 529AC(Cameron, 1969, 29-38). Indeed, the reasons of Philoponos' gradual reversal towards Christianity (after 529) can be attributed on pressure held by the ascendant Christian community of Alexandria so that the school to be closed.

Consequently, Philoponos' work being inspired by neoplatonic orientation as well as christian principles, can be considered like a pendulum which swung between these theoretical bounds.

The influence of Philoponos' principles on Mechanics was diffused among the Arab commentators, influenced their works and was well known by the Latin Scholastic Commentators of Late Middle Ages, like Jean Buridan and Nicole Oresme.

## Philoponos' Approach On Dynamics

Philoponos confronted aristotelian Natural Philosophy with a very critic attitude which led him to achieve a very radical view on the Aristotelian corpus. His objections were placed on fundamental principles of the aristotelian natural philosophy which opposed Christian principles either in heavens, i.e. the separation of the sublunar Cosmos from heavens, the existence of the ether, the infinite existence of Cosmos, or on major points of the aristotelian Dynamics, i.e. the non existence of vacuum space, the Aristotelian law of motion and the interpretation of violent motions.

So he did not follow the aristotelian principle for the eternal existence of the Universe and he opined that there is a starting point of Cosmos's creation. Also, he did not accept the limitation of Cosmos and he regarded it infinite and unbounded (Wildberg1988, Elweskiöld 2005).

[1] According to some researchers, Philoponos was not a christian by birth. He studied with Ammonios and wrote several philological works, commentaries and other non-theological works during that period. According to these researchers, later in his life - around 520 AD – Philoponos accepted the christian principles and he wrote the rest of his works including the theological ones. Other researchers have indicated that in his *Commentaries on Aristotle's Physics*, there are certain statements against Cosmos' eternity and, therefore, at 517 (which is the year referred by the author in the text) Philoponos had already become christian. A third opinion on this matter has been presented by K. Verrycken (Verrycken, 1990) and accepted by R. Sorabji (Sorabji [1987] 2010, 1990). According to this view, Philoponos was a christian when he met Ammonius. Being inspired by Ammonios teaching, he turned to a neoplatonist commentator and this can be observed in his first works, up to 529. After that year, his works do not have major neoplatonic principles and so we can conclude that he returned to the christian principles he had followed early in his life. A turning point of this view is the determination of the date of the *Commentaries on Physics*. It has been proposed that Philoponos composed initially the *Commentaries* in 517, having neoplatonic orientation. Later he rewrote part of the work (the Books 1-4 and fragments on Space and on Vacuum) under christian principles, which can be found in Berlin's Academy edition. In any case, we can conclude that Philoponos after 529 AD had gradually abandoned views concerning eternity in Nature.

Concerning motion, Philoponos recognized its importance as a natural process[2]. He believed that all bodies have a "potential tendency", as he called it, which is responsible for their motion[3]. This consideration is close to the Aristotelian view for the motion and can be considered as representative of the first neoplatonic version of his *Commentaries on Aristotle's Physics*. Actually, during that period of his life he did not neither mention nor hint in his written works any impetus impulse into movables so that they can be capable to move: According to Philoponos' view at that time, the cause of motion was meant to be an internal quality of movables.

Later he confronted violent motions more radically. If we search at his essays we see that, initially, he mentioned the aristotelian interpretation of antiperistasis for violent motions. According to it any medium should have 3 discernible roles during violent motions, i.e. to be pushed forward by projectiles, then to move backwards so to be behind of projectiles and finally to move again forward. Then, Philoponos set some crucial questions which demonstrated the weakness of that interpretation and he concluded stating that "all these seem to be totally improbable"[4]. So we can presume that Philoponos had denied the aristotelian view of the impelling role of any medium during violent motion.

He also commented on the standing contact between projectiles and motive forces. On this issue, he set some questions regarding the place whether the impelling power was given: Would it be given in the surrounding medium or within the projectiles? He introduced a hypothetical experiment: He proposed that we put an arrow (or, alternatively, a stone) on the top of a thin stick. Then, using a series of "machines", we set on motion a great amount of air behind the body. Then Philoponos wrote that, according to antiperistasis' interpretation, there should a ratio between the embodied force to air and the projectile's velocity, namely stronger force should lead to higher velocity. But, he said, we do not observe any motion achieved whatever the volume of the imparted force is[5]. So, he concluded, the force which is required for that violent motion should be embodied to projectile itself and not to the surrounding medium. According to this interpretation, this force is embodied initially to the projectile by the motive force and makes it capable to be in motion for certain period of time[6].

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[2] He stated that "whoever do not fully understand motion, he does not understand either nature", Philoponus Joannes, *In Aristotelis Physica commentaria*, ed. Hieronymus Vitelli (*Comment. in Arist. Graeca* xvi, xvii), Berlin 1988, 339.15- 17.
[3] i.bid., 195.24 – 32, 581.9-31 & 690.20-27.
[4] i.bid. 640.5.
[5] i. bid. 641.19-29.
[6] i. bid. 641.29-642.9. As we are informed by Simplicius, the first scholar who had attempted to introduce an initial theory of impetus for interpret ting projectile's motion was the mathematician Hipparchus (Simplicius, In Aristotelis de Caelo commentaria, ed. J.L. Heiberg (*Comm. In Arist. Graeca* vii), Berlin 1894,

## Philoponos on void and law of motion

Philoponos declined the aristotelian definition of space: While Aristotle regarded that space is everything which surrounds natural object[7], Philoponos considered every extensible area as "space" regardless of the existence natural objects within it[8]. Consequently, Philoponos could accept the possibility of void space and, consequently, the existence of motions in it. He regarded that if we put a natural object in a void space this does not mean that it will be simultaneously in two different locations but it can move in certain limited period of time. He also mentioned that in a void space, the motions of natural objects which have different weights have different velocities respectively. Additionally, he mentioned that void space is the place where there is nothing to impede motion[9].

These fragments indicate the alternative perspective which Philoponos chose to follow for the question of void space, compared to the one which Aristotle had followed: He accepted the potential existence of the vacuum space attributing it certain qualities likewise any other medium. Under this confronting, any additional effect meant to be an additional time for objects' motions added to the time needed for motions in the void space. This confronting of the void space alters the existence of any medium for motions from the point to be a fundamental factor to a parameter connected only with the duration of motions.

Moreover, Philoponos opposed to the ratio set by Aristotle concerning motive forces and durations of motion. He indicated that if we drop two objects with different weights from the same height, we observe that the times which the objects need to fall onto the ground do not follow the ratio of weights but there is only a small time difference between them[10].

His methodological approach to criticize the aristotelian law of motion is includes a hint of the possible existence of motions in a void space and concludes to formulate an alternative law of motion which involve it.

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264.25). The force which is imposed to projectiles, according his view, can be interpreted for us been acquainted in mathematical terms for natural phenomena dually: either as the magnitude of momentum or as a packet of kinetic energy which is imparted into projectiles. In any case, Philoponos' arguments on violent motion have to be considered as an early attempt to introduce the later so called "impetus theory", proposed by scholars of the 13th century mainly in Paris University.

[7] Aristotle, *Physica,* 212a20-21.

[8] Philoponos, i.bid., 592.16-32). This fragment seemed to be part of the revised version because in other pages of the Vitelli's edition of Philoponos' *Commentaries on Aristotle's Physica* we can find definition for space which are similar with the aristotelian view. See i.bid. 454.23-24, 526.20-23, 536.6-7, 539.5-6,555.25-27.

[9] i.bid., 681.19-23.

[10] i.bid. 683.18-22 and 683.29-34..

He described the motion of an object covering a certain distance into different mediums. He proposed to consider a body moving a certain distance in different mediums starting his view from the void space where it would need one hour to move in a certain distance. So he assumes that the object will need two hours to cover the distance in water with certain density. Then he put the same object into air which has half of the density of the water. Then, he informs us that the object will need half of an hour less to cover the same distance, i.e. one hour and a half. If we reduce the density of the medium even more at half of the air, then the duration of the motion will be one hour and a quarter of an hour. If we continue to reduce the density of the medium we will observe that the additional time of the motion will be reduced infinitively because time is infinitively divisible[11]. At this exceptional experiment that he described to us, we can understand clearly Philoponos' insight as he adopts abstract methodology to describe the relation between the medium and the resistance. Under this scheme, he confronted the whole issue as a mathematical function where time has the role of the dependent variable and the resistance of the medium has the role of the independent variable. Concerning the correlation between the motive force and the resistance of the medium, Philoponos seems that accepted a relation where the velocity of any moving object is proportional with the imposed force on it subtracting the resistance of the medium. So, the reduction of the density of the medium has as outcome the increase of the velocity which can be observed in natural processes. At the final point of the reduction of the density of mediums, i.e. at the void space, projectile's velocity "measures exactly the force's action" (Franklin 1976, 531).

## Conclusions

Philoponos' innovative approaches are set onto main principles of the aristotelian Natural Philosophy.

On one hand, on the methodological approach he used and on the other hand on the notions he introduced for interpreting phenomena of Dynamics. Though the background of his methodological approaches can be traced on the christian principles he followed early in his life, we cannot attribute him theological or uncompromising initiations. The continual theoretical "pendulum", i.e. the gradual removal he adopted from the neoplatonic views towards the Christian principles which are notable in several points of his work highlights it as a distinguished essay on natural Philosophy of that changing era.

[11] i.bid. 681.17-682.19.

The method he followed included aspects which are fundamental in the scientific method set after the 17th century: abstractions and hypothetical experiments. Consequently, Philoponos raised for Dynamics' study new perspectives as he was diversified from Aristotle's method where experience was preponderant.

Also, the new concepts that he introduced could, implicitly, accelerate the evolution of ideas in Dynamics and lead towards the law of inertia. Particularly, the acceptance on behalf of Philoponos' the possibility of motions in a void space was a turning point which could emerge scholars to interpret it more thoroughly as the acceptance of motions in a vacuum was based on the rejection of major aristotelian principles (like the primitive role of the medium during motion and the inverse proportion of weight and motion time). So the acceptance of the existence of void space was very innovative when it was introduced by Philoponos. On the other hand, it could effects radical and revolutionary conclusions for the natural Philosophy. But posterior scholars continued to study motions within the air, i.e. the surrounding space of frictions so most of them did not accept Philoponos' views of violent motions. Scholastics at the University of Paris during 13th century introduced the impetus theory as an alternative interpretation for violent motions. According to it, projectiles were given an amount of sufficient moving force to overcome the amount of friction of the surrounding medium and could move. But Philoponos had enhanced already this theory with the possibility of motions into vacuum and this addition could determine a radical critic to the aristotelian Dynamics and indicate an initial step towards law of inertia.

Consequently Ioannes Philoponos' contribution on Dynamics can be considered as a major theoretical link between Antiquity's theories on Nature and Late Middle Ages commentaries on Aristotle's *Physica* as his perspectives swung, willingly or not, between the limits of this peculiar philosophical pendulum.

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# THE RELATIONSHIP BETWEEN SCIENCE AND FAITH IN BYZANTINE CANON LAW

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## Introduction

This paper is part of a research project in progress about natural philosophy, sciences and alchemy in Byzantine era.[1] Among the others sources (scientific texts, technical, chronicles etc.), the Canon Law is very crucial and valuable, as presents the official theoretical and practical Christian orthodox attitude to secular sciences in both the Byzantine social formation and in Ottoman period, when the orthodox Patriarch was the head of the Christian orthodox millet.

## The Byzantine Canon Law

The term "Canons" (regulae - *Κανόνες*) eventually acquired a technical meaning as the body of ecclesiastical law or of its individual regulations. As canonical were recognized the rulings of several Christian councils, both ecumenical (Nicaea of 325, Constantinople of 381, Ephesus of 431, Chalcedon of 451, Trullo (Constantinople) of 691, Nicaea of 787) and local (esp. the Councils in Ankara of 314, Gangra of 370, Carthage of 418-419), the precepts of several authoritative church fathers (Basil of Caesarea, Gregory of Nyssa, Gregory of Nazianzos, Amphilochios of Ikonion, Cyril of Alexandria, Tarasios, Patriarch of Constantinople, Fhotios, Patriarch of Constantinople), as well as the compilation by some downstream church officials, as Matthew Vlastaris.

Canon law covered broad areas of ecclesiastical structure, church disciplines, norms of morality and behaviour, liturgy, etc. Ioannes Zonaras[2] distinguishes "the

[1] Dacalbo Project (Digital archive concerning alchemy in Byzantium and in Greek-speaking communities of the Ottoman Empire), http://dacalbo.hpdst.gr/

[2] «περὶ δογμάτων ζητήσεις καὶ ψήφους ἐποιήσαντο», J.P. Migne (ed.), *Patrologia Cursus Completus*, vol. 137, Paris 1865, col. 509D.

investigation of dogma and decisions (psephoi - ψῆφοι)" from formal canons that should, according to Theodore Valsamon, bear the signatures of emperors and "fathers".[3] In theory, canons had to be approved "by the common volition and unanimous desire"[4] of the council participants. Canons were considered to be "divine," "saintly," or "holy." Emperor Justinian, in 6th century, emphasized the importance of canons: thus, in his novel 131 of 545 he endowed the canons of the first four ecumenical councils with the validity of imperial legislation.[5]

As mentioned above, the church, especially in the earlier period, was concentrating on its own business that is orthodox belief, discipline, and the organization of the church.[6] However, if we accept that clergies and monks represented more and more a powerful element in Byzantine society,[7] as in the period of Iconoclasm, as example, it's clean that the Canon law played a key-role in Byzantine ideology, attitudes and the whole perception of world, making the framework in which people was lived.

## The *Syntagma* by Ralles-Potles

The main texts of Byzantine Canon law edited by Georgios Ralles and Michael Potles in six volumes from 1852 until 1859. Georgios Ralles born in Constantinople in 1804 or 1805 and became professor emeritus in School of Law at University of Athens in 1837. Michael Potles born in Vienna in 1810 and became the first professor of Canon law in School of Law at University of Athens. The monumental collection *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων* (*Syntagma of divine and holy Canons*) by G. Ralles and M. Potles is the most important collection of Byzantine Canon Law, since it includes the Canons from 6th to 14th century. The "Syntagma", as mentioned above, consists of six volumes. The first volume contains the Canon by Patriarch Photios, from 9th century, which includes the "Nomokanon of Fourteen Titles" ("Σύνταγμα εἰς δεκατέσσαρες τίτλους") compiled by Anonymous in 578-582, with the commentary by Theodore Valsamon, Patriarch of Antioch and nomophylax in 12th century.

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[3] «ὑπογραφὰς τῶν ἐκθεμένων τὰς συνόδους βασιλέων και Πατέρων», J.P. Migne (ed.), *Patrologia Cursus Completus*, vol. 137, Paris 1865, col. 509A.

[4] J.D. Mansi, *Sacrorum Consilliorum Nova et Amplissima Collectio*, tom. 11, Florence 1765, 933D.

[5] "Therefore we order that the sacred, ecclesiastical rules which were adopted and confirmed by the four Holy Councils, that is to say, that of the three hundred and eighteen bishops held at Nicea, that of the one hundred and fifty bishops held at Constantinople, the first one of Ephesus, where Nestorius was condemned, and the one assembled at Chalcedon, where Eutyches and Nestorius were anathematized, shall be considered as laws. We accept the dogmas of these four Councils as sacred writings, and observe their rules as legally effective", S.P. Scott, *The Civil Law*, Cincinnati 1932, http://droitromain.upmf-grenoble.fr/Anglica/N131_Scott.htm.

[6] Bernard Stolte, "The social function of the law", in John Haldon (ed.), *A social history of Byzantium*, Wiley-Blackwell, UK 2009, p. 78

[7] Michael Angold, "Church and Society: Iconoclasm and After", in John Haldon (ed.), *A social history of Byzantium*, Wiley-Blackwell, UK 2009, p. 234

The second volume contains the Canon by St Apostles and the Canons of Ecumenical Councils (i.e. Nicaea 1st and 2nd, Ephesus, Chalcedon, 5th and 6th, etc.)[8] with commentary by Alexios Aristenos, a nomophylax, teacher in imperial School of Law in Constantinople and deacon in Church of St Sophia in 12th century, by Ioannes Zonaras, protasekretis and at the last years of his life a monk, in 12th century, and also by Theodore Valsamon.

The canons of local councils are in the third volume with the commentary by the same canonists; the Canons and the Canonical Epistles by Fathers of Church are in the fourth volume, as well as rules by councils and patriarchs, novels by Byzantine Emperors, epistles, list of bishops and dioceses etc. are in fifth volume.

The six and last volume includes another compilation, the text «*Σύνταγμα κατά στοιχείον*», a Canon by Mathaios Vlastaris, who lived in 14th century in Thessaloniki.

## The sciences in Byzantine Canon law

The canons were divided into four parts:

a) The canons ratifying the doctrinal decisions of the first six ecumenical councils along with the teachings of the Fathers of the Church.

b) The canons specifying the obligations of the ministration clergy.

c) The canons referring to the monks.

d) The canons referring to the secular.

Searching for the canons about sciences, we can find relevant provisions in all above categories.

The first Canon related to sciences is the Canon Λς΄ (36th) of the Council in Laodicea in Phrygia, between 357 and 368, which refers:

"The priests and clerics must not be sorcerers, astrologers or mathematicians, or make amulets, which bind souls. And those who wear them must be expelled from the church".[9]

This canon, between others about pagans and Jews, includes the mathematicians (means astronomers) in the magicians and astrologers, properties that prohibited the clergy and monks.

[8] This "Syntagma" by Photios concludes the Canons of 5th-6th Ecumenical Council (691), of 7th Ecumenical Council (787), and also the Canons of so-called "First-Second" Council of Constantinople from his days (861), as well as of Council from 879-880, which is considered the 8th Ecumenical Council.

[9] «Ὅτι οὐ δεῖ ἱερατικοὺς ἢ κληρικούς, μάγους ἢ ἐπαοιδοὺς εἶναι, ἢ μαθηματικούς, ἢ ἀστρολόγους, ἢ ποιεῖν τὰ λεγόμενα φυλακτήρια, ἅτινά ἐστι δεσμωτήρια τῶν ψυχῶν αὐτῶν. Τοὺς δὲ φοροῦντας, ῥίπτεσθαι ἐκ τῆς ἐκκλησίας ἐκελεύσαμεν», G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, vol. 3, Athens 1953, p. 203.

Ioannis Zonaras' commentary here, after eight centuries, in 12th century, is very interesting. Zonaras begins his interpretation writing that the scientific disciplines are four, i.e. arithmetic, geometry, astronomy and music, according the tradition of quadrivium.[10] After a description of their content (which is very valuable for the history of Byzantine sciences), he results that these lessons raise question about predictions that may lead the monks away from God.[11]

Theodore Valsamon, instead, in his interpretation, emphasizes that the only forbidden lesson is astronomy, so the monks and clergies could to study the other three subjects.[12]

It is worth noting here that the term "mathematician" means astronomer, and this Canon as the commentators doesn't distinguish between astronomers and astrologers.

In the other hand, interpreting the Canon 53 about the announcement of Easter Day (ογ΄: "Περὶ τοῦ τὴν ἡμέραν τοῦ Πάσχα ἐν τῇ ἡμέρᾳ τῆς συνόδου ἀγγέλλεσθαι") of Council of Carthage (419), Valsamon shows how to find the date following the astronomical method…[13] This is a question related with another poem by Valsamon, as we will see below.

The next reference to mathematicians is in Canons which attributed to Patriarch Photios,[14] in 9th century.

In his compilation under the title *Νομοκάνων*,[15] Photios in title 9, "About sins by bishops and clergies", in chapter 25, includes a rule "About apostates, people who offers sacrifices, magicians, mathematicians, astrologes etc.".[16]

According this rule, clergies and monks could study geometry but not "mathematics", which mean astronomy. The mathematicians have to burn their relevant books; otherwise they have to desert the cities where they live.

The same title "About apostates, people who offers sacrifices, magicians, mathematicians, astrologes etc." is the chapter 20 (Κ) in title 13 (ΙΓ) "About seculars".[17]

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[10] For the tradition of quadrivium in Byzantine era, see Gianna Katsiampoura, *Πρόσληψη, μετάδοση και λειτουργία των επιστημών στους μεσοβυζαντινούς χρόνους και το Quadrivium του 1008* (*Perception, transmission and function of science in middle Byzantine era and the Quadrivium of 1008),* PHD Dissertation, Department of Sociology, Panteion University of Social and Political Science, Athens 2004.

[11] G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, op.cit., p. 203-205.

[12] G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, op.cit., p. 205-206.

[13] G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, op.cit., p. 489-492.

[14] Phaedon Koukoules, «Μνεία Δεισιδαιμονιῶν τινῶν καὶ μαγικῶν συνηθειῶν εἰς Νομοκανόνας», *Εὐχαριστήριον, Τιμητικὸς Τόμος ἐπὶ τῇ 45ετηρίδι ἐπιστημονικῆς δράσεως καὶ τῇ 35ετηρίδι τακτικῆς καθηγεσίας Ἀμίλκα Σ. Ἀλιβιζάτου*, Athens 1958, pp. 227-238. (http://apostoliki-diakonia.gr/gr_main/catehism/theologia_zoi/themata.asp?cat=hist&NF=1&main=texts&file=13.htm)

[15] G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, vol. 1, Athens 1852.

[16] «Περὶ κληρικῶν ἀποστατῶν, καὶ θυτῶν, καὶ μάγων, καὶ ἐπαοιδῶν, καὶ ἀστρολόγων, καὶ μαθηματικῶν, καὶ περὶ μαντειῶν, καὶ φαρμακειῶν, καὶ περιάπτων», G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, vol. 1, op. cit., p. 188.

[17] G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, vol. 1, op.cit., p. 321.

In 12th century, Theodore Valsamon, in a compilation under the title "Responses to questions by Mark, Patriarch of Alexandria" (*Ἀποκρίσεις εἰς τὰς κανονικὰς ἐρωτήσεις Μάρκου Πατριάρχου Ἀλεξανδρείας*),[18] answers the Question 27 (Ἐρώτησις ΚΖ΄) if a priest or a deacon could become, among others, physician or astrologer, that the only knowledge who a priest or a deacon could have is about geometry, not astronomy. Also, a priest or a deacon couldn't be physician.[19]

Another patriarch, Leon Stypes, patriarch of Constantinople in 12th century (1134-1143), in a "Memorandum" (*Λέοντος τοῦ Στυππῆ Σημείωμα συνοδικὸν)*[20] accuses those who makes drugs without Christian faith.

Completing this description of Byzantine Canon Law, it should be mentioned the work of Matthew Vlastaris. Matthew Vlastaris, in his «Σύνταγμα κατὰ στοιχεῖον»[21] refers also to astrologers and mathematicians.[22] He writes that mathematicians glorify the stars, so they are damnable, but he continues saying that the astronomy is different from astrology.

## The tradition of Canon law in Post Byzantine period

The tradition of Nomocanons continued in the post Byzantine period, under the Ottomans. A first quick survey in some monasteries' libraries found a lot of manuscripts which contains Canon law. Some of the most interesting manuscripts are in Library of Vlatadon Monastery in Thessaloniki. We will refer three of them, from 16th century, from 17th century and the last from 18th.

The first manuscript contains all the rules about astronomers, mathematicians and physicians, which have referred above.[23]

The second, except the rules about magicians, mathematicians, diviners, astrologers etc., contains a philosophical chapter about the platonic three part of soul.[24]

The last one, from 18th century, includes a very crucial chapter about the four elements (wind, fire, earth and water), which was the base of world and, in our opinion the most interesting point, human. [25] It is worth noting this last point, an open question about how this sentence connected with Christian cosmogony. The sentence resembles that of John of Damascus (c.676-749), who wrote about the four elements as the basis of

[18] G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, vol. 4, Athens 1854.
[19] «Ἀκινδύνως γίνεται ἱερεὺς, ἢ διάκονος καταλλάκτης, ἢ κομμερκιάριος, ἢ ἰατρὸς, ἢ ἀστρολόγος, ἢ οὔ;», G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, vol. 4, op.cit., p. 468.
[20] G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, vol. 5, Athens 1855, p.78.
[21] G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, vol. 6, Athens 1859.
[22] G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, vol. 6, op.cit., p. 358.
[23] Coll. of Vlatadon monastery, manus. 59, ch. 116, 124, 146, 242, 262, 263, 264
[24] Coll. of Vlatadon monastery, manus. 84, ch. β, γ, δ, ε
[25] Coll. of Vlatadon monastery, manus. 32, ch. 336

creation,[26] but here is most clear the relation between the four elements and the human being.

## As conclusion

As we could see, in chronological order, the first Council's canons reject at all the sciences as related with pagan tradition and magic. Basically, the rules include reference to mathematics, astronomy and astrology. The main problem for church is the predictions, so clergies and monks couldn't study mathematics, because are dangerous for their faith.

During the next centuries, Nomokanons and commentators change their attitude on sciences and give directions for astronomical calculations, like Ioannes Zonaras. It should be noted that even the vocabulary used is now many references to celestial phenomena as the Valsamon introductory poem in Photios Nomokanon.[27] Until the post Byzantine period, when the Nomokanons includes parts about natural philosophy.

These changes are an open question about the relation between sciences and faith and subject for more research.

26 John of Damascus, «Ἔκδοσις ἀκριβὴς τῆς ὀρθοδόξου πίστεως», Bonifatius Kotter, *Die schriften des Johannes von Damaskus*, Verlag, Berlin, New York 1973.

27 G. Ralles, M. Potles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων*, vol. 1, op.cit., pp. 1-3.

ΣΥΝΤΑΓΜΑ
ΤΩΝ ΘΕΙΩΝ
ΚΑΙ ΙΕΡΩΝ ΚΑΝΟΝΩΝ
ΤΩΝΤΕ ΑΓΙΩΝ ΚΑΙ ΠΑΝΕΥΦΗΜΩΝ
ΑΠΟΣΤΟΛΩΝ,
ΚΑΙ ΤΩΝ ΙΕΡΩΝ ΟΙΚΟΥΜΕΝΙΚΩΝ ΚΑΙ ΤΟΠΙΚΩΝ
ΣΥΝΟΔΩΝ,
ΚΑΙ ΤΩΝ ΚΑΤΑ ΜΕΡΟΣ ΑΓΙΩΝ
ΠΑΤΕΡΩΝ,
ΕΚΔΟΘΕΝ,
Σὺν πλείσταις ἄλλαις τὴν ἐκκλησιαστικὴν κατάστασιν
διεπούσαις διατάξεσι,
ΜΕΤΑ ΤΩΝ ΑΡΧΑΙΩΝ ΕΞΗΓΗΤΩΝ,
Καὶ διαφόρων ἀναγνωσμάτων,
ΥΠΟ
Γ. Α. ΡΑΛΛΗ ΚΑΙ Μ. ΠΟΤΛΗ,
Ἐγκρίσει τῆς Ἁγίας καὶ Μεγάλης τοῦ Χριστοῦ Ἐκκλησίας,
Καὶ τῆς Ἱερᾶς Συνόδου τῆς Ἐκκλησίας τῆς Ἑλλάδος.
ΤΟΜΟΣ ΠΡΩΤΟΣ.
ΑΘΗΝΗΣΙΝ,
ΕΚ ΤΗΣ ΤΥΠΟΓΡΑΦΙΑΣ Γ. ΧΑΡΤΟΦΥΛΑΚΟΣ.
1852.

The first volume of Syntagma by G.A. Ralles and M. Potles, 1852

Mathaios Vlastaris, figure from the cod. 483, f. 2r, Monastery of Vatopedion, Mount Athos, 15th c.

# Ο ΜΟΝΑΧΟΣ ΔΙΔΑΣΚΑΛΟΣ ΚΑΙ Ο ΑΡΙΣΤΟΤΕΛΗΣ: ΝΙΚΗΦΟΡΟΣ ΒΛΕΜΜΥΔΗΣ, *ΕΠΙΤΟΜΗ ΦΥΣΙΚΗΣ* (THE SCHOLAR-MONK AND THE ARISTOTLE: NIKEPHORE BLEMMYDIS, EPITOME PHYSICA)

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The Byzantine monk, scholar and founder of a 13th c. school, Nicephoros Blemmydes, who had a strong influence on the imperial court of the Empire of Nicaea and the next generations of scholars of the Palaeologian period, wrote manuals about the main sections of secular knowledge (logic, physics, astronomy, geography), as well as pedagogical works and theological texts. Among his works, one of the most interesting is the epitome De Physica, which, following Aristotle's Physics in content and form, puts particular weight on the issue of the eternity of the cosmos, in an effort to prove Aristotle wrong and provide his own Christian version.

The present paper presents this particular effort to harmonize Aristotelian and Christian principles, which was widely accepted, judging by the number of manuscripts and editions of the book until the 18th century.

Το θέμα της σχέσης ανάμεσα στη θρησκεία και τις επιστήμες στην Ανατολική Ρωμαϊκή Αυτοκρατορία ήταν καθοριστικό για την ιδεολογία της, το χαρακτήρα της, αλλά και την εκπαίδευση. Οι πηγές, ήδη από την ίδρυση της Αυτοκρατορίας, περιγράφουν, μεταξύ άλλων, τη θέση την οποία ένας χριστιανός θα έπρεπε να υιοθετήσει όσον αφορά τη

χριστιανική πίστη και τις επιστήμες στο βυζαντινό κράτος, σε σχέση με το *κοινωνικό, το επιστημονικό και κυρίως το εκπαιδευτικό πλαίσιο*.[1] Χαρακτηριστική ήταν η προσπάθεια για τη νομιμοποίηση των επιστημών και της επιστημονικής εκπαίδευσης μέσα από τις προσπάθειες των λογίων, να αποδείξουν ότι οι επιστήμες δεν έρχονται σε αντίθεση με τη χριστιανική πίστη και σημαντικές για την ανάλυση της σχέσης θρησκείας-επιστήμης στο Βυζάντιο είναι οι αλλαγές που σηματοδοτούν με τις αντίστοιχες αντιλήψεις τους.[2]

Σε αυτό το πλαίσιο η περίπτωση του λογίου-μοναχού Νικηφόρου Βλεμμύδη είναι πολύ σημαντική. Κυρίαρχη πνευματική μορφή του ύστερου Βυζαντίου στην προσπάθεια ερμηνείας του κόσμου βάσει των επιστημονικών αρχών σε συναρμογή με τη χριστιανική θεολογία, ο Νικηφόρος Βλεμμύδης καθόρισε εν πολλοίς την πνευματική και επιστημονική συζήτηση στην Αυτοκρατορία της Νίκαιας (1204-1261),[3] η οποία είχε αντικαταστήσει για περίπου 60 χρόνια τη βυζαντινή, άσκησε μεγάλη επίδραση στην επόμενη γενιά λογίων που διαμόρφωσαν το κίνημα που στη ιστοριογραφία είναι γνωστό ως Παλαιολόγεια Αναγέννηση.

Ο Νικηφόρος Βλεμμύδης γεννήθηκε το 1197 στην Κωνσταντινούπολη και ήταν γόνος εύπορης οικογένειας, αφού ο πατέρας του ήταν γιατρός. Με την κατάληψη όμως της πρωτεύουσας από τους Σταυροφόρους (1204) βρέθηκε με τους γονείς του πρόσφυγας διαδοχικά στην Προύσα, στη Νίκαια και τελικά στην Έφεσο. Και στις τρεις αυτές πόλεις παρακολούθησε μαθήματα γραμματικής και ρητορικής. Στη Νίκαια διδάχτηκε λογική, ενώ στην Έφεσο και τη Σμύρνη σπούδασε ιατρική, την οποία για κάποιο διάστημα άσκησε κιόλας. Τέλος, διδάχτηκε μαθηματικά, φυσική, οπτική και αστρονομία. Δάσκαλός του υπήρξε ο Πρόδρομος Σκαμανδρηνός, ερημίτης μοναχός, ο οποίος τον μύησε στα μαθηματικά, την οπτική, τη γεωμετρία και την αστρονομία. Αμέσως μετά, έχοντας αποφασίσει να ακολουθήσει εκκλησιαστική σταδιοδρομία, χειροτονείται διάκονος, λαμβάνει τον τίτλο του λογοθέτη του πατριαρχείου της Νίκαιας και διορίζεται επίτροπος στο Νυμφαίο, όπου βρίσκονταν τα αυτοκρατορικά ανάκτορα. Το 1235 εκάρη μοναχός και εγκαθίσταται σε μονή του όρους Λάτρος, ενώ την ίδια χρονιά χειροτονείται πρεσβύτερος από τον μητροπολίτη Εφέσου. Εκεί κοντά, στην μονή Παξαμαδίου, ιδρύει και την πρώτη του σχολή. Πολύ σύντομα ο αυτοκράτορας Ιωάννης Γ' Βατάτζης τον ανακάλεσε στη μονή του Αγίου Γρηγορίου για να του αναθέσει τη

[1] Efthymios Nicolaidis, *Science and Eastern Orthodoxy*, The John Hopkins University Press, Baltimore 2011.
[2] Gianna Katsiampoura,"Faith or Knowledge? Normative relations between religion and science in Byzantine textbooks", *Almagest, International Journal for the History of Scientific Ideas*, vol. 1, is. 1, May 2010, Brepols, σ. 112-123.
[3] Για μια εικόνα της επιστημονικής συζήτησης στη συγκεκριμένη περίοδο, βλ. Constantinides C.N., *Higher Education in Byzantium in the Thirteenth and Early Fourteenth Centuries*, Cyprus Research Centre, Nicosia 1982, και Γιάννα Κατσιαμπούρα-Ευθύμιος Νικολαΐδης, «Επιστημονική Ανάπτυξη στην Αυτοκρατορία της Νίκαιας», Εγκυκλοπαίδεια Μείζονος Ελληνισμού, 2006, http://www2.ehw.gr/asiaminor/forms/filePage.aspx?lemmaId=4285.

διεύθυνση της εκεί σχολής και να του στείλει τον γιο του Θεόδωρο, μετέπειτα αυτοκράτορα Θεόδωρο Β' Δούκα Λάσκαρι, να μαθητεύσει κοντά του. Το 1248 εγκαθίσταται ξανά στην Ημαθία, κοντά στην Έφεσο, όπου ιδρύει τη μονή Όντος Θεού και παραμένει εκεί μέχρι το τέλος της ζωής του. Παράλληλα με το μοναχικό και διδασκαλικό του έργο, ασχολήθηκε και με άλλα ζητήματα, τόσο θεολογικού όσο και πολιτικού περιεχομένου, ενεργώντας ως πρεσβευτής και σύμβουλος εξ απορρήτων του αυτοκράτορα.[4]

Ο Νικηφόρος Βλεμμύδης σε όλη τη ζωή του ανέπτυξε και πολύ έντονη συγγραφική δραστηριότητα. Συνέγραψε εγχειρίδια για τους βασικούς τομείς της θύραθεν γνώσης (λογική, φυσική, αστρονομία, γεωγραφία), αλλά και έργα που αναφέρονταν στην παιδαγωγική, όπως και θεολογικά κείμενα.[5]

Σημαντική πηγή για τη συζήτηση των σχέσεων επιστήμης και θρησκείας στη συγκεκριμένη περίοδο είναι το έργο του *Εισαγωγική Επιτομή* που περιλαμβάνει τα εγχειρίδια *Επιτομή Λογικής* και *Επιτομή Φυσικής*, έργα που χρησιμοποιήθηκαν ως βάση διδασκαλίας για πολλούς αιώνες αργότερα τόσο στη Δύση όσο και στην Ανατολή. Στο δεύτερο, την *Επιτομή Φυσικής* (*Εισαγωγικής επιτομής βιβλίον Β΄, Περί φυσικής ακροάσεως*),[6] αποτελούμενο από 32 κεφάλαια, προσπαθεί να ερμηνεύσει τα φυσικά φαινόμενα με βάση τις φυσικές αρχές και τα φυσικά αίτια, εξετάζοντας βασικές έννοιες της φυσικής φιλοσοφίας, όπως τον χρόνο, την κίνηση, τον χώρο, την αιωνιότητα του κόσμου, την κίνηση των πλανητών, αλλά και φυσικά φαινόμενα, όπως τις βροντές, τους σεισμούς κ.α. Είναι σημαντικό, ωστόσο, ότι στο έργο του η χριστιανική κοσμοθεωρία δεν δρα ανασταλτικά στην προσπάθεια ορθολογικής ερμηνείας που καταβάλλει. Όντας, γνώστης των αρχαίων Ελλήνων φυσικών φιλοσόφων και κυρίως του Αριστοτέλη, υιοθετεί το αρχαιοελληνικό πρότυπο για έναν πεπερασμένο Κόσμο, ο οποίος όμως είναι προϊόν της άπειρης σοφίας του Δημιουργού.

Η *Επιτομή Φυσικής* αποβλέπει στη γνώση, και μάλιστα στην επιστημονική γνώση· «αντικείμενό» της είναι η φύση. Όσον αφορά τη μέθοδο μέσω της οποίας θα αποκτηθεί η γνώση της φύσης, αυτή δεν μπορεί να είναι άλλη από την επιστημονική μέθοδο. Αντιλήψεις (δόξαι) προγενεστέρων φιλοσόφων που ασχολήθηκαν με τη φύση ελέγχονται από τον Βλεμμύδη, ενώ παράλληλα λειτουργούν ως εφαλτήριο του δικού

[4] . Όπως φαίνεται από τα στοιχεία που αντλούνται από την αυτοβιογραφία του Βλεμμύδη, *Του αυτού Νικηφόρου μοναστού και πρεσβυτέρου, του κτήτορος, περί των κατ' αυτόν διήγησις μερική,* στο *Nicephori Blemmydae, Curriculum Vitae et Carmina*, ed. Aug. Heisenberg, Teubner, Λειψία, 1896. Βλ. και Γιάννα Κατσιαμπούρα, «Νικηφόρος Βλεμμύδης», Εγκυκλοπαίδεια Μείζονος Ελληνισμού, 2006, http://www.emg.gr/asiaminor/Forms/fLemmaBody.aspx?lemmaid=5545

[5] Το σύνολο έργο του εκδόθηκε στην *Ελληνική Πατρολογία*, J.P. Migne (επιμ.),, *Patrologia Graeca*, Παρίσι 1857-66, τ. 142, 527-1634 (στο εξής P.G.). Για μια συνοπτική παρουσίαση, βλ. George Zografidis, "Nikephoros Blemmydes", στο Henrik Lagerlung (ed.), Medieval Philosophy, Springer Netherlands 2011, σ. 892-895.

[6] «Νικηφόρου του Βλεμμίδου Εισαγωγικής επιτομής βιβλίον Β΄, Περί φυσικής ακροάσεως», P.G. 1023-1314.

του προβληματισμού και της προσωπικής του έρευνας. Η κύρια πηγή του είναι το αριστοτελικό έργο, κυρίως τα *Φυσικά* και το *Περί ουρανού*.

Είναι σαφές από το πρώτο κεφάλαιο της *Επιτομής* ότι ο Βλεμμύδης, καθορίζοντας τις φυσικές αρχές και τα αίτια, ορίζει ως ποιητικό αίτιο του σύμπαντος τον Θεό και ως τελικό αίτιο τη θεία καλοσύνη.[7] Με άλλα λόγια, ο Θεός δημιούργησε τον κόσμο και ως εκ τούτου θα μπορούσε κάποιος να γνωρίσει τον Θεό με τη γνώση της φύσης. Παρουσιάζει τις βασικές αρχές της αριστοτελικής φυσικής, ενώ προσθέτει σε αυτές χριστιανικές κοσμολογικές αρχές (ο Θεός είναι η πρώτη αιτία της Δημιουργίας, ο Θεός είναι ο αρχιτέκτονας ο οποίος δημιούργησε τον κόσμο).[8] Ως εκ τούτου, χρησιμοποιεί χριστιανικούς όρους για να εξηγήσει γιατί ο κόσμος δεν είναι αιώνιος. Αναλύει τα τέσσερα αίτια του Αριστοτέλη: ύλη, είδος, αρχή μεταβολής, τέλος (υλικό, ειδικό, ποιητικό, τελικό) και θεωρεί ότι η αριστοτελική θεωρία των τεσσάρων αιτίων δεν είναι τόσο μια θεωρία της αιτιότητας όπως τη νοούμε σήμερα, όσο μια ολοκληρωμένη ερμηνευτική θεωρία· δεν περιορίζεται στο να αιτιολογεί γεγονότα, αλλά ερμηνεύει όντα και γεγονότα. Δεν αποβλέπει μόνο στο να εντάξει τα φαινόμενα σε μία λογική διαδοχή, αλλά στοχεύει στη βαθύτερη οντολογική κατανόηση όντων και φαινομένων. Έτσι, η αριστοτελική θεωρία των αιτίων έχει μεγαλύτερο εύρος αναφοράς και πληρέστερους επιστημονικούς στόχους από μία θεωρία της αιτιότητας.[9]

Παρά τα σημεία ταύτισης υπάρχουν ωστόσο σημεία διαφοροποίησης στη θεωρία του Βλεμμύδη από την αριστοτελική θεωρία.

Κατ'αρχάς η εντελέχεια στη φιλοσοφία του Αριστοτέλη είναι κατηγορία με πολλαπλή οντολογική σημασία. Παρουσιάζεται ως έκφραση της εσωτερικής δυναμικής των πραγμάτων, συνδέεται με την κίνηση και παρουσιάζεται ως αρχή διαλεκτική - ως εσωτερική αρχή κίνησης και μεταβολής.[10] Ο Βλεμμύδης δίνει στην έννοια ένα διαφορετικό περιεχόμενο και χρησιμοποιεί σχεδόν ανθρωπομορφική γλώσσα για να περιγράψει την τελεολογία στη φύση. Ο κόσμος, κατά την άποψη του Βλεμμύδη, είναι σωστά διατεταγμένος, δηλαδή καθετί στον κόσμο είναι έτσι ρυθμισμένο ώστε να εξασφαλίζει την πρόοδό του προς την καλύτερη δυνατή κατάσταση. Αποδίδει δηλαδή προαίρεση στο Θεό[11].

Όσον αφορά την κίνηση, Βλεμμύδης και Αριστοτέλης συμφωνούν στο να λαμβάνεται το πρώτο κινούν ως αρχή απ' όπου εκπορεύεται η κίνηση. Για τον

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[7] «Ὅθεν ποιητικὸν αἴτιον (καὶ) κυρίως καὶ πρώτως ὁ θεῖος ἐστι νοῦς. καὶ τελικὸν ἡ αὐτοῦἀγαθότης, δι' ἣν πᾶσαν κτίσιν ἐδημιούργησεν, ἵνα γνωρίζηται καὶ κηρύττηται», P.G.1025γ.
[8] «κατὰ τὴν νεῦσιν τοῦ μόνου σοφοῦ ἀρχιτέκτονος καὶ πανταιτίου Θεοῦ», P.G.1097δ.
[9] P.G. 1033-1040
[10] Αριστοτέλους *Φυσικά*, μτφρ., επιμ., εισαγ. Βασίλης Κάλφας, Νήσος, Αθήνα 2015, 201α10 κ.α.
[11] «Κυρίως δε ποιητικόν αἴτιον πάσης κτίσεως, αἰσθητῆς τε καί νοητῆς, ό Θεός», P.G. 1040-1060.

Βλεμμύδη μπορεί τότε να είναι ο Θεός, ενώ στην αριστοτελική φιλοσοφία δεν πρόκειται για υπερφυσικό ον. Ο Βλεμμύδης αναφέρει ότι η κίνηση φαίνεται να είναι αναλλοίωτη ιδιότητα της φύσης. «Αφού λοιπόν η φύση είναι αρχή κίνησης και μεταβολής και αφού το θέμα μας είναι η φύση, δεν πρέπει να αφήσουμε στη σκιά τι είναι κίνηση. Γιατί, αν δεν τη γνωρίσουμε, αναγκαστικά δε θα γνωρίσουμε ούτε τη φύση». Η κίνηση, λοιπόν, είναι συνεχές, και το συνεχές ορίζεται συχνά ως αυτό που μπορεί να διαιρεθεί επ' άπειρον. Ο τόπος, ο χρόνος, το κενόν είναι επίσης έννοιες που περιέχονται στην κίνηση[12]

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Ο Βλεμμύδης αμύνεται υπέρ της διαρκούς λειτουργίας του γίγνεσθαι στα όρια της φυσικής πραγματικότητας και υποστηρίζει την εκ του μηδενός δημιουργία του κόσμου από το Θεό. Αναφέρει ότι η κύρια πρόταση του είχε ως πυρήνα της την ύπαρξη μίας και ενιαίας φυσικής πραγματικότητας η οποία υπόκειται σε όλες τις μεταβολές. Διατείνεται δε ότι η θεωρία του Αριστοτέλη σχετίζεται με τον προβληματισμό προηγουμένων φιλοσόφων σχετικά με τη γένεση και τη φθορά-εξαφάνιση των όντων. Αυτοί αποδείχτηκαν άπειροι και οδηγήθηκαν σε λανθασμένα συμπεράσματα (α. κανένα ον δεν γίνεται ούτε φθείρεται, β. δεν υπάρχουν πολλά αλλά μόνο ένα ον).[13]

Το κοσμολογικό πρόβλημα βρίσκεται στο κέντρο της φιλοσοφίας της φύσης του Αριστοτέλη. Ο Αριστοτέλης διατυπώνει μία κοσμολογία, στην οποία η θεωρία του αιθέρα παίζει αποφασιστικό ρόλο. Κοντά στα τέσσερα στοιχεία, πυρ, αέρα, γη, και ύδωρ, με την τάση εκ φύσεως που έχει το καθένα για ανοδική και καθοδική κίνηση, μπαίνει και ένα πέμπτο, ο αιθέρας, που η φυσική του κίνηση είναι κυκλική, ώστε να ερμηνευθεί η αιώνια ομαλή κυκλική κίνηση του κλειστού και πεπερασμένου σύμπαντος.

Το πρόβλημα, όπως το έβλεπε ο ίδιος ο Βλεμμύδης, ήταν να ερμηνευθούν οι ιδιαίτερου είδους φυσικές κινήσεις των ουράνιων σωμάτων, τα οποία κινούνται σε ομαλές κυκλικές τροχιές. Πώς, όμως, θα μπορούσαν να εξηγηθούν αυτές οι αιώνιες και απαράλλακτες κυκλικές κινήσεις των ουράνιων σωμάτων;

Η απάντηση του Αριστοτέλη σε αυτό το θέμα ήταν η εξής: τοποθέτησε τη Γη στο κέντρο του κόσμου και οικοδόμησε, με βάση τη γεωκεντρική υπόθεση, ένα σύμπαν αυστηρά ιεραρχημένο. Αποτελεί έκδηλη ανάγκη να βρίσκεται η γη στο κέντρο του σύμπαντος και να παραμένει ακίνητη. Με αυτή τη θεώρηση, ο Αριστοτέλης, δημιουργεί ένα απόλυτο σύστημα αναφοράς από πενήντα πέντε σφαίρες για να εξηγήσει όλες τις πλανητικές τροχιές, σύστημα στο οποίο μπορούν να ανάγονται οι κινήσεις όλων των σωμάτων.

[12] P.G. 1061-1078.
[13] P.G. 1079-1090.

Τα ουράνια σώματα, κινούνται ακατάπαυστα πάνω σε κυκλικές τροχιές γύρω από το κέντρο του κόσμου, τη Γη. Η αιτία για αυτές τις κινήσεις ήταν το «πρώτο κινούν», η πρωταρχική δηλαδή αιτία της δημιουργίας του κόσμου.[14]

Το σύμπαν κατά τον Αριστοτέλη είναι πεπερασμένο και με όρια. Σ' αυτό το σύμπαν, τα ουράνια σώματα εκτελούν τέλειες, ομαλές κυκλικές κινήσεις (κύκλους). Τελειότητα, στασιμότητα και αιωνιότητα είναι τα κύρια χαρακτηριστικά της ουράνιας σφαίρας, η οποία κινείται σε ομαλή κυκλική τροχιά.

Για τον Βλεμμύδη δεν υπάρχει αντίστοιχος προβληματισμός, καθώς όλα έγκεινται στη σοφία του δημιουργού: «γενέσεως ἀρχὴ καὶ αἰτία μόνη ἐστὶν ἡ παντουργὸς σοφία καὶ δύναμις τοῦ Θεοῦ».[15] Τι λέει για την κίνηση των ουράνιων σωμάτων; Εδώ πρέπει να αναφερθεί ότι συμφωνεί αλλά την αποδίδει στη θεϊκή βούληση.

Μία τελική αναφορά αξίζει να γίνει στην προσπάθεια του Βλεμμύδη να αποδώσει επιστημονικά και το φαινόμενο της έκλειψης του ήλιου, θέμα που απασχολούσε τους λογίους της εποχής. Κι ενώ διατείνεται ότι πρόκειται για ένα φυσικό φαινόμενο, δεν διστάζει να αναφερθεί στο φαινόμενο της έκλειψης την ημέρα της σταύρωσης χαρακτηρίζοντας το ένα υπερφυσικό φαινόμενο-θαύμα[16].

Είναι αλήθεια ότι δεν μπορεί κανείς να μιλήσει για άμεσες ομοιότητες μεταξύ ενός φιλοσόφου του 5ου αιώνα π.Χ., ο οποίος πρότεινε μία θεωρία του χρόνου ως προϊόν του φιλοσοφικού του στοχασμού, και ενός χριστιανού λογίου, ο οποίος θεμελίωσε τη θεωρία του για το χρόνο πάνω σε ένα εξαιρετικά εκλεπτυσμένο έργο στον 13° αιώνα.

Χωρίς να παραβλέπουμε τις προφανείς διαφορές που θα μπορούσε αναμφίβολα να επισημάνει κανείς στο έργο των δύο στοχαστών, έχει παρόλα αυτά ιδιαίτερη σημασία να παρατηρήσουμε ότι και οι δύο στοχαστές επεσήμαναν τις αδυναμίες του στατικού κοσμοειδώλου, ο καθένας της εποχής του, και προσπάθησαν να οικοδομήσουν ένα δυναμικό μοντέλο της φύσης που διέπεται από μία χρονική δομή. Συνέλαβαν, έτσι, και οι δύο τον χρόνο ως έναν πραγματικό παράγοντα μέσα στη φύση και όχι ως μια ψευδαίσθηση, η οποία είναι απλό δημιούργημα της συνείδησης. Και για τους δύο στοχαστές ο χρόνος είναι αλληλένδετος με τη μεταβολή και το γίγνεσθαι του φυσικού κόσμου, η κύρια ουσία του οποίου είναι η μετάβαση από την εν δυνάμει στην εν ενεργεία κατάσταση με έναν σαφή προσανατολισμό από το παρελθόν προς το μέλλον.

Λίγα αλλά εξαιρετικά σημαντικά τα σημεία στα οποία διαφοροποιούνται οι δύο στοχαστές και που συνδέονται όχι μόνο με την εποχή την οποία έζησαν, αλλά κυρίως με τη κοσμολογική θεώρηση του καθενός, η οποία στην περίπτωση του Αριστοτέλη είχε

[14] P.G. 1115-1128.
[15] P.G. 1065στ.
[16] «Μόνη δὲ τῶν ὅλων ἡ κατὰ τὴν σωτήριον τοῦ Κυρίου γεγονυῖα σταύρωσιν ἔκλειψις ὑπὲρ φύσιν γέγονεν ἅπασαν», P.G. 1252θ.

στενή σχέση με το βαθύ φιλοσοφικό του στοχασμό και την μελέτη προγενέστερων φιλοσόφων, ενώ στην περίπτωση του μοναχού Βλεμμύδη με τη χριστιανική του αντίληψη. Κατά συνέπεια ο Βλεμμύδης,

- Υποστηρίζει την εκ του μηδενός δημιουργία του κόσμου από το Θεό απορρίπτοντας την έννοια της αιωνιότητας και του κενού. Το κενό είναι απλά ένα στοιχείο της κίνησης.
- Η εντελέχεια ως έννοια συνδέεται με την προσπάθειά του ανθρώπου για βελτίωση προκειμένου να πλησιάσει την τελειότητα του δημιουργού του, του Θεού. Άρα δεν συνδέεται απλά με την εσωτερική δύναμη και κίνηση των σωμάτων.
- Από τη στιγμή που υπάρχει ο δημιουργός όλων, ο Θεός, δεν υπάρχει ανάγκη ύπαρξης ενός πέμπτου στοιχείου, του αιθέρα, που να δικαιολογεί τις κυκλικές κινήσεις των ουράνιων σωμάτων.

Το σημαντικό όσον αφορά τον Βλεμμύδη είναι ότι θέτει τέτοιου είδους προβληματισμούς που εκκινούν από τις αρχές της αρχαίας φυσικής φιλοσοφίας, εντάσσοντάς τις μεν στο χριστιανικό κοσμοείδωλο, αλλά ταυτόχρονα επιμένοντας στην ορθολογική ερμηνεία τους. Κι αυτό υπήρξε παρακαταθήκη για την επόμενη γενιά Βυζαντινών λογίων, αυτούς που συμμετείχαν στο ρεύμα της Παλαιολόγειας Αναγέννησης, με ιδιαίτερο ενδιαφέρον για τη φυσική φιλοσοφία. Ο Βλεμμύδης είναι λοιπόν χαρακτηριστικό παράδειγμα λογίου που οι χριστιανικές καταβολές του δεν τον απέτρεψαν από την προσπάθεια ερμηνείας του φυσικού κόσμου και τον οδήγησαν να διατυπώσει ένα σχήμα ορθολογικό, για τη λειτουργία του φυσικού κόσμου, εμμένοντας στις εξηγητικές αρχές της αρχαίας φυσικής φιλοσοφίας που ήταν επαρκείς επιστημολογικά για την εποχή.

# CALCULATION OF MOVEABLE RELIGIOUS FEASTS IN ARITHMETIC OF GLYZONIOS

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## Introduction

Calendar is a system of time's measurement and days' classification, which was created in order the organization of public life and of religious rituals to be facilitated while the temporal classification of past and future events was made possible.

Although early Mathematics was developed in their bigger part in relation to trade and agriculture, it was correlated, along with Astronomy's development, and with religious practices. Various civilizations created calendars based on the movements of the celestial bodies (Mankiewicz 2002, 16), since they defined accurately the change of seasons and important annual events with the help of astronomical observations (Halkia 2006, 45).

Initially people, based on their sensorial experience, had stable unit of time the "νυχθήμερον" (night and day) (Ptolemaeus, *Hypotheses*), according to which the perpetual flow of time was manifested with the constant sunrise or the reset of the fixed stars at the same point of the celestial dome: «ἁπλῶς ἡ τοῦ ἡλίου ἀπό τινος τμήματος ἤτοι τοῦ ὁρίζοντος ἢ τοῦ μεσημβρινοῦ πάλιν ἐπί τό αὐτό ἀποκατάστασις» (Ptolemaeus, *Syntaxis Mathematica*). However, the time flow with base the "νυχθήμερον" or Moon's phases did not allow the precise knowledge of the repetition of the year's seasons.

Egyptians created a calendar in which the year was directly related, not only to the changes of Niles's level but also, to the orbit of Sun, Sirius and of other stars (Exarchakos 1997, 427-431). They Egyptians observed that the Nile flooded every year shortly after Sirius would appear in the East, before sunrise and that these solar risings appeared every 365 days, leading them to the establishment of a solar calendar which included 12 months of 30 days each and 5 additional days of celebration at the end of each year (Boyer and Merzbach 1991, 11). These five days were called 'induced' days and each one

was considered the birth-day of the gods: Osiris, Horus, Seth and the goddesses: Isis and Nefthis (Exarchakos ibid).

Babylonian's calendar was lunar. The first day of the month coincided with the moon's appearance. Each day was lasted from the one sunset to the other. Babylonians were particularly interested in the prediction of the new moon and the duration of the month, which were 29 or 30 days (Mankiewicz 2002, 17-18).

Solar calendar was known to Greeks as early as 600 B.C., as it is witnessed from the enigma of the wise Cleobulus from Rhodes: «Εἷς ὁ πατήρ, παῖδες δυοκαίδεκα. τῶν δέ ἑκάστῳ παῖδες δίς τριάκοντα διάνδιχα εἶδος ἔχουσαι· αἱ μέν λευκαί ἔασιν ἰδεῖν, αἱ δ' αὖτε μέλαιναι· ἀθάνατοι δέ τ' ἐοῦσαι, ἀποφθινύθουσιν ἅπασαι. ἔστι δέ ὁ ἐνιαυτός» (One father, twelve children, and to each child twice thirty daughters belong, different in looks. White are half of them, black are the other half. All of them are immortal, yet they all die). The answer is the year (Diogenes Laertius, *Vitae philosophorum*).

Because the determination of the number of the days between two certain Babylonian or Greek New Year's days was encountered serious difficulties, Egyptian calendar was the one that it was established as astronomical system or reference and maintained throughout Middle Ages (Neugebauer 1969, 81). The advances of Arabs mathematicians in trigonometry led to the construction of astronomical tables of bigger precision and the further development of Astronomy. Islamic calendar was based on lunar months and the five daily prayers should be done at hours which were regulated by the position of the Sun (Mankiewicz 2002, 49).

## The determination of Easter's date in Christian world

Religious feast is the celebration of important ecclesiastical events associated with the earthly life of Christ (Dominical), Virgin Mary (Marian), the apostles, the martyrs, the saints and the holy ones of Christian faith. From these the Dominical are the most ancient and they are divided into movable and immovable feasts. In movable ones are mainly included the feasts of Easter's cycle, that is to say Easter, the pre-Easter feasts of M. Lent, the events of Holy Week, Ascension, Pentecost and all the other smaller feasts of Triodion and of Pentecost (Theodossiou and Danezis 1995, 175-177). The system of various feasts covers the whole calendar year and influences various activities of daily life, which concern not only the faithful but also the social life.

Since the First Ecumenical Council at Nicaea of Bithynia in 325 A.D. was established Easter to be celebrated on the first Sunday following the full moon which follows spring equinox. In case the full moon is on Sunday, Easter is celebrated next Sunday, in order not to coincide with the celebration of Jewish Passover (Feidas 2002, 284).

Easter's date determination constitutes a complex mathematic and astronomical problem, since it is done with base the seven days' week and it takes into account Earth's movement around the Sun and Moon's movement around Earth (Dryllerakis 1995, 8-9).

After the First Ecumenical Council, Patriarch of Alexandria undertook to arrange the determination of the full moon of Easter for all Christian churches. For the determination of future full moon in Alexandria it was then used the cycle of Meton and Julian calendar.

Metonic cycle or Moon cycle, which is the period of 235 lunar months and is equal to approximately 19 years of 365,25 days, that is to say that the fool moons are repeated the same dates every 19 years, had constituted Greek Calendar's base until the adoption of the Julian one in 45 B.C. Julian Calendar was covering the difference of about 11 days between the solar and lunar year, which resulted due to the inaccurate determination of the day's duration. According to it, three consecutive years had 365 days and every fourth year was "bissextile" and had 366 days. However, the year of the Julian Calendar was longer than the real one, resulting every 129 years the error to reach the one day. On the initiative of Pope Gregory XIII the October 5$^{th}$ of 1582 renamed October 15$^{th}$, in order to correct the error of the ten days which had accumulated the previous 11 centuries, so the vernal equinox to return on 21th March. In Gregorian Calendar a year is a bissextile if it is divisible by 4, apart from the years of the centuries which are bissextile only if they are divisible by 400. Thus, during 400 years, we have not 100 but only 97 bissextile years (Vlamos et al 2000, 114-115).

Italy was one of the first catholic states which adopted Gregorian Calendar in 1582. The Julian Calendar remained in force in all Orthodox states until the beginnings of 20$^{th}$ century. In Greece Gregorian Calendar was adopted on February 16, 1923, which was renamed in 1$^{st}$ March because 13 days were added since the years 1700, 1800, 1900 are not bissextile years according to this calendar (ibid). The Greek Orthodox Church accepted the coincidence of the ecclesiastical and the political calendar a year after only for the unmovable feasts but not for the Paschalio Calendar and the movable feasts, which they continue to be determined based on the Julian one. The difference of Easter's celebration between Orthodoxe and Catholics is due to the error the Julian Calendar and to the error of Meton's cycle, with which the Orthodox church still calculates the dates of the future spring fool moons (Theodossiou and Danezis 1995, 167-169).

## Emmanouil Glyzonios and his work

Emmanouil Glyzonios was born in Chios around 1540, where he learned his first education. At an early age he went to Italy, where he studied philology and medicine (Katramis 1880, 211; Amantos 1919, 75). He settled in Venice, where he worked first as a corrector in the Greek printing houses. Afterwards he dealt with the trade of manuscripts, writing and book publishing, and even maintaining his own printing-house (Paparounis 1977, 391). In 1567 his work *Αριθμητική* (*'Arithmetic')* was published and in 1588 *Ευαγγελιστάριο ('Lectionary'*), which mainly contained tables to finding evangelical readings and sounds of Sundays, as well as the finding of Easter's date (Legrand 1885, 64-65, n.183; Matthiopoulos 2009, 443). In 1595 he published two of the *Μηνιαία ('Monthly'),* September and October, and Agiasmatarion (small euchologion) entitled «Σύνταγμα τῶν ἀναγκαίων ἀκολουθιῶν καθ΄ ἑκάστην ἀνηκουσῶν τῷ ἱερεῖ, ἐπιμελείᾳ Ἐμμανουήλ Γλυζωνίου. Venetiis apud Franciscum Julianum, 1595» in 1586 the *Ψαλτήριο ('Psaltery'),* in 1587 *Ανθολόγιο* (an anthology of patristic texts) and the «Βιβλίον λεγόμενον ἀναγνωστικὸν» *('Book called Reader'*) with ecclesiastical readings in the period 1595-96 (Legrand 1885, 110-111, n.212-213, 47-48, n.174, 48-50, n.175, 112-113, n.216). He died in 1596.

## The work *Practical Arithmetic* of Emmanouil Glyzonios

In 1567 Glyzonios assured the printing licence of his *Arithmetic*, which was circulated a year later (Baralis and Havaranis 2012). The entire title of the work is: «Βιβλίον πρόχειρον τοῖς πᾶσι περιέχον τήν τε Πρακτικήν Ἀριθμητικήν, ἤ μᾶλλον εἰπεῖν τὴν Λογαριαστικήν. Καί περί τοῦ πῶς νὰ εὑρίσκῃ ἕκαστος τό ἅγιον Πάσχα, καί τέλειον Πασχάλιον πάντοτε. Καί περὶ εὑρέσεως Σελήνης, ἐν ποία ἡμέρα γίνεται ἡ γέννα αὐτῆς.» ('Book Extempore for all, containing Practical Arithmetic or to say better Computation, how everyone to always find the (date of the) Holy Easter and the complete Paschalion and how to find which day the moon is born')The book is established as didactic textbook of arithmetic and has great editorial success (Sklavenitis 1991, p.18, following note 5). According to M.Paranikas, Glyzonios is a 'scientist' and 'the first one who wrote Arithmetic in common language, overseeing the edition of ecclesiastical books and compiling Lectionary and Paschales' (Paranikas 1867, 166).

## The computation of the movable religious celebrations in Glyzonios's *Arithmetic*

In his *Arithmetic* Glyzonios, after his discussion on numbers, starts the Appendix in which he teaches the ways of determination of the movable religious feasts.

| | | |
|---|---|---|
|  <br>*Πρακτικήν Ἀριθμητικήν,*<br>Venice 1724 | In Appendix's begging, before the chapters' start, an image of the Ascension of Christ is putted forward, accompanied by the phrase: |  <br>*Πρακτικήν Ἀριθμητικήν,*<br>Venice 1818 |

# ΘΕΪΚΗ ΚΑΙ ΑΝΘΡΩΠΙΝΗ ΕΥΔΑΙΜΟΝΙΑ ΣΤΗ ΓΝΩΣΙΟΘΕΩΡΙΑ ΤΟΥ ΙΑΤΡΟΦΙΛΟΣΟΦΟΥ ΘΩΜΑ ΜΑΝΔΑΚΑΣΗ (DIVINE AND HUMAN HAPPINESS IN THE EPISTEMOLOGY OF THE IATROPHILOSOPHER THOMAS MANDAKASSIS)

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The representative of modern Greek Enlightenment Thomas Mandakassis (b. Kastoria 1709 – d. Leipzig 6/28/1796) was a student of Evgenios Voulgaris and a remarkable case of Greek diaspora patriot, who wrote works on medicine, philosophy and theology. His ignored by research epistemological views can be found in the rreatise titled "On the invisible understood through the visible, and on the immaterial that become material by their energies, and on known things" (Leipzig 1760), which was rather unjustly considered by K. Th. Demaras to be of a loose thought and expression. According to the epistemology adopted by Mandakassis, the Humankind holds from God the inclination not only to know things, but also to appreciate them, something which can be accomplished during its past life. More specifically, the "heart-knowing" God has offered this power to Humankind so that it may continuously study and produce theory and action in both the material world and the true assets of divine origin. Thus, the logical immaterial and immortal soul of Humankind can, through scientific knowledge, among other, experience beatitude, happiness and bliss, which in its absolute forms characterize God. From this point of view, Mandakassis praises highly both the ancient Greeks and his contemporary Europeans for their love for scientific knowledge and its benefits. He himself, in his doctoral medicinal thesis (Leipzig 1757), underlined that his aim was to offer to his fellow compatriots "all the benefits of knowledge and sciences" so that they may delight their soul and benefit their body. He states, however, that if Humankind chooses not to acquire knowledge of things, then it will be deprived of its

ability to enjoy the material and non-material goods of the resulting happiness. On the other hand, it cannot be imposed upon anyone to activate his/her powers of knowledge and accomplishing happiness, if it is not a result of free will. The imbued by European Enlightenment notion of Humankind's inherent tendency to acquire scientific knowledge in order to achieve happiness on Earth was a common motif in the works of his contemporary scholars, such as Iossipos Moesiodax (Apology, Vienna 1780), schoolmate of Mandakassis and advocate of modern science, and Dimitrios Darvaris (Guidance to Goodness, Vienna 1791), also a scholar and teacher from western Macedonia, whom Mandrakassis had consulted on his studies.

Ο εκπρόσωπος του νεοελληνικού Διαφωτισμού Θωμάς Μανδακάσης (Καστοριά 1709 – Λιψία 28.6.1796) υπήρξε αξιοσημείωτη περίπτωση Έλληνα επιστήμονα και λογίου της διασποράς με συγγραφικό έργο στην ιατρική, τη φιλοσοφία, τη θεολογία και την παιδαγωγική. Έχοντας γεννηθεί από πλούσια οικογένεια, μάλλον γουνεμπόρους, έμαθε τα πρώτα του γράμματα πιθανότατα στη γενέτειρά του. Συνέχισε τις σπουδές του στην Κοζάνη, κοντά στον Ευγένιο Βούλγαρη, έχοντας ίσως συμμαθητή του και τον Ιώσηπο Μοισιόδακα (περ. 1725-1800), θερμό θιασώτη της νεωτερικής επιστήμης. Στη συνέχεια ο Μανδακάσης σπούδασε στη Ρωσία, στο γυμνάσιο του μοναστηριού της Αγίας Τριάδας. Επίσης παρακολούθησε επιστημονικά μαθήματα στο φιλοσοφικό τμήμα της Μεγάλης του Γένους Σχολής στην Κωνσταντινούπολη, ενώ το 1755 πιθανολογείται ότι δίδαξε στην Αυθεντική Ακαδημία του Ιασίου (Ευαγγελίδης [1936] 2008, τ. Β΄, 397). Μεταξύ των ετών 1752-1757 σπούδασε στη Χάλλη και στη Λιψία ιατρική και φιλοσοφία. Διδάκτορας της Ιατρικής αναγορεύθηκε στη Λιψία, όπου και εκδόθηκε η διατριβή του περί ομοιοπάθειας στα ελληνικά και λατινικά (Μανδακάσης 1757),[1] υπό την εποπτεία του διάσημου ιατρού Johann Ernst Hebenstreit (1703-1757).[2] Προφανώς, η δίγλωσση έκδοση, που ήταν το πρώτο βιβλίο σε ελληνική γλώσσα κατά την προεπαναστατική περίοδο από Μακεδόνα συγγραφέα, απέβλεπε στη διαφώτιση του ελληνικού πληθυσμού σε θέματα υγείας, καθώς και στη δημιουργία ελληνικής ιατρικής ορολογίας (Καραμπερόπουλος και Μαρκέτος 1999, 54). Το επάγγελμα του ιατρού ο Μανδακάσης το άσκησε στη Λιψία μέχρι τον θάνατό του. Με τη συγγραφή της *Φυλλάδας* (Μανδακάσης 1761· Moennig 1996), επιχείρησε να καταπολεμήσει τον

[1] Μέσω αυτής της διατριβής γίνεται για πρώτη φορά σε ελληνικό έντυπο μνεία για τα ερυθρά αιμοσφαίρια. Βλ. ενδεικτικά Καραμπερόπουλος και Μαρκέτος 1999, 46· Καραμπερόπουλος 2008, 246.

[2] Κατά την περίοδο των σπουδών του Μανδακάση στη Λιψία διαπρεπής Καθηγητής Θεολογίας, που διατέλεσε και Πρύτανης στο ίδιο πανεπιστήμιο, ήταν ο Johann Christian Hebenstreit (1686-1756), αδελφός του δικού του επιβλέποντος καθηγητή, διακρινόμενος επίσης για τη φιλολογική και φιλοσοφική του κατάρτιση. Σε αυτό το πλαίσιο μπορεί να πιθανολογηθεί η ενθάρρυνση του Μανδακάση για περαιτέρω ενασχόληση με τη φιλοσοφία και τη θεολογία.

αναλφαβητισμό,[3] ενώ παρέδιδε και μαθήματα γλώσσας σε Έλληνες εμπόρους της Λιψίας, καθώς και νεοελληνικά γράμματα σε Γερμανούς. Επιπλέον, ο Μανδακάσης υπήρξε επιμελητής και χορηγός της έκδοσης ελληνικών βιβλίων, τα οποία απέστελλε δωρεάν στα σχολεία των ομογενών στην Οθωμανική αυτοκρατορία. Με τις ενέργειές του η Λιψία, όπου δεν εφαρμοζόταν καμμία λογοκρισία, καθιερώθηκε ως η πόλη έκδοσης των βιβλίων του πρώιμου νεοελληνικού Διαφωτισμού (Polioudakis 2008, 119). Έτσι, δικαιολογείται ο χαρακτηρισμός του ως λαμπρού παραδείγματος Έλληνα πατριώτη ιατροφιλόσοφου της διασποράς (Henrich 2009, 83). Ενδιάμεσα και για διάστημα λίγων ετών, δηλαδή από το 1765 ή 1766 ή 1767 μέχρι το 1770, διατέλεσε σχολάρχης στην Καστοριά,[4] διαδεχόμενος έναν από τους συντηρητικότερους λογίους, τον επίσης Καστοριανό Σεβαστό Λεοντιάδη (1690-1765/70), οπαδό της νεοαριστοτελικής φιλοσοφίας και αντίπαλο του Βούλγαρη και του Μοισιόδακα (Τεμπέλης 2015). Από τους συγχρόνους λογίους, με τους οποίους συνδεόταν ο Μανδακάσης, μνημονεύεται και ο Δημήτριος Δάρβαρης (1757-1823), Δυτικομακεδόνας παιδαγωγός, τον οποίο ο Μανδακάσης είχε συμβουλεύσει να επιλέξει το Πανεπιστήμιο της Χάλλης για τις σπουδές του (Σιώκης 2004· Σειρηνίδου 2013, 34).

Παρά το γεγονός ότι ο Μανδακάσης είχε συγγράψει και εκδώσει έργα φιλοσοφικού και θεολογικού περιεχομένου, δεν έχει υπάρξει μέχρι σήμερα συστηματική καταγραφή, μελέτη και αξιολόγηση των απόψεών του. Αυτό ισχύει κυρίως για το αποτελούμενο από 480 σελίδες γνωσιοθεωρητικό και θεολογικό *Σύγγραμμά* του (Μανδακάσης 1760), το οποίο μάλλον άδικα θεωρήθηκε από τον Κ.Θ. Δημαρά ([1949] 2000, 155) ότι χαρακτηρίζεται από χαλαρότητα στη σκέψη και την έκφραση.[5] Επιπλέον, ο Μανδακάσης (1766) ως παράρτημα σε έργο του Κωνσταντίνου Δαπόντε συμπεριέλαβε έξι φιλοσοφικού και θεολογικού περιεχομένου στιχουργήματά του σε απλή διάλεκτο, που αποκλήθηκαν «*ἔπη πολιτικά*» (Ζαβίρας 1872, 317).[6] Οι μόνες κρίσεις, που διατυπώθηκαν από συγχρόνους του Μανδακάση για τη φιλοσοφική

[3] Ευχαριστώ τον Δρα Ulrich Moennig, Καθηγητή του Πανεπιστημίου του Αμβούργου, και τις κκ. Sylvia Sobiech και Christiane Michaelis, βιβλιοθηκαρίους της Πανεπιστημιακής Βιβλιοθήκης του Rostock (Abteilung Sondersammlungen), για τις ψηφιακές μορφές του μοναδικού γνωστού αντιτύπου της *Φυλλάδας* του Μανδακάση.

[4] Σύμφωνα με τον Κιτρομηλίδη (1992, 57), «*ο πρώτος ιατροφιλόσοφος της Δυτικής Μακεδονίας, ο Καστοριανός Θωμάς Μανδακάσης ο οποίος είχε επιστρέψει από τις σπουδές του στην ιατρική σχολή της Λειψίας για να διευθύνει την αναδιοργανωμένη σχολή της γενέτειράς του, αποτελεί τον συνδετικό κρίκο μεταξύ των δύο τύπων των λογίων του Διαφωτισμού, των δασκάλων και των ιατροφιλοσόφων*». Γενικότερα για τον βίο και το έργο του Μανδακάση, βλ. ενδεικτικά Σάθας 1868, 554-555· Ευαγγελίδης (1936) 2008, τ. Α΄, 120· Τσαμίσης 1949, 87· Ζάττας 1984, 41, 52-58· Αλεξίου 1991, 5-19· Moennig 1996· Reichelt 2012.

[5] Πβ. επίσης Δημαράς ([1977] 1989, 15), όπου η μορφή του Μανδακάση περιγράφεται ως ωχρή και θαμπή.

[6] Μετά το εισαγωγικού χαρακτήρα τετράστιχο («*Θέμα*»), τα υπόλοιπα στιχουργήματα επιγράφονται: «*Περὶ τῆς εἰς ἡμᾶς τοῦ Θεοῦ ἀγάπης*», «*Δέησις μετ' αἰνέσεως*», «*Περὶ Μαθήσεως*», «*Νουθεσία*» και «*Ἔπαινος πρὸς τὸν ἑαυτοῦ φίλον*». Πβ. την εσφαλμένη πληροφορία του Ζάττα (1984, 56): «*Τα τέσσερα αυτά ποιήματα βρίσκονται στην Ε.Β.Ε. αριθμ. βιβλίου Θ. 8435, προσηρτημένα στο έργο "Ἱερὰ Γραφὴ εἰς ποιήσεις", άγνωστου συγγραφέα και σαν συμπλήρωμα στις σελίδες 437-448*».

παρουσία του, είναι εκείνες των Νικηφόρου Θεοτόκη[7] και Ευγένιου Βούλγαρη.[8] Κατά τον Αλεξίου (1991, 8), ο Καστοριανός ιατροφιλόσοφος στις πολυετείς σπουδές του γνώρισε πολύ καλά όλα τα προ αυτού φιλοσοφικά συστήματα, δεν προσχώρησε όμως σε κανένα από αυτά, ούτε ανήκε σε κάποια αυτόνομη φιλοσοφική σχολή. Λόγω της χριστιανικής πίστης του, το φιλοσοφικό υπόβαθρό του ενείχε κυρίως θεολογικό περιεχόμενο.

Σύμφωνα με τη γνωσιοθεωρία, την οποία δέχεται ο Μανδακάσης, ο άνθρωπος διαθέτει από τον Θεό κατ' αρχάς την ίδια τη γνώση. Με αυτήν τη θέση θεμελιώνεται και το επιχείρημα ότι στη φύση τα πράγματα δεν είναι ούτε «*αὐτόματα*», ούτε «*ἄτεχνα*», όπως ισχυρίζονται πολλοί.[9] Ο φιλάνθρωπος Θεός έχει χορηγήσει στον άνθρωπο και την έφεση όχι μόνο για τη γνώση των πραγμάτων, αλλά και για την απόλαυσή τους, που μπορεί να επιτευχθεί ήδη στη διάρκεια του πεπερασμένου βίου του.[10]

Εδώ πρέπει να επισημανθεί ότι ο Μανδακάσης σε όλες τις δραστηριότητές του λειτούργησε ως φορέας της διαποτισμένης από τον ευρωπαϊκό Διαφωτισμό αντίληψης περί της έμφυτης στον άνθρωπο τάσης για απόκτηση επιστημονικής γνώσης, με σκοπό την ευδαιμονία επί της γης. Ως Καστοριανός, πρέπει να γνώριζε ότι με ευθύνη του Λεοντιάδη σε εκείνη τη σχολή η κατάρτιση των νέων δεν γινόταν με βάση τα διδάγματα της ευρωπαϊκής επιστήμης, τα οποία οδηγούν τις κοινωνίες στην πρόοδο. Έτσι, διεξαγόταν μία κατά βάθος σκοταδιστική διδασκαλία, που ταλάνιζε τους νέους σπουδαστές με την απεραντολογία και τη φλυαρία μιας επιφανειακής και μηχανικής γραμματικής ανάλυσης όρων της αριστοτελικής φιλοσοφίας, και μάλιστα υπό το πρίσμα του κορυδαλισμού. Από την πλευρά του, ο Μανδακάσης ως σχολάρχης στην Καστοριά κατά πάσα πιθανότητα ευαγγελιζόταν ένα νέο ήθος μορφωμένου ανθρώπου, ο οποίος πιστεύει στην καλλιέργεια των επιστημών με σκοπό την ευδαιμονία. Η ίδια άποψη αποτέλεσε κοινό τόπο και στα έργα λογίων συγχρόνων του Μανδακάση. Ο Μοισιόδαξ δεχόταν ότι η «*ὑγιὴς φιλοσοφία*», ένα σημαντικό αίτημα του καιρού του,

[7] Θεοτόκης 1766, [6]: «*Ἀνὴρ ἀγαθὸς καὶ φιλόθεος ὑπῆρξεν ὁ Μανδακάσης καὶ ἔργου ἀγαθοῦ προϊστάμενος καὶ διὰ τὴν ἀρετὴν οὐχ ἧττον ἢ διὰ τὸ ἐπὶ φιλοσοφίᾳ καὶ λοιπῇ παιδείᾳ εὐδόκιμον*». Πβ. Ζάττας 1984, 53· Αλεξίου 1991, 5· Μακρίδης 2011, 366. Σημειώνεται ότι το έργο του Θεοτόκη, στο οποίο ο ίδιος αναφέρεται επαινετικά για τον Μανδακάση, εκδόθηκε με τη συμπαράσταση και την οικονομική ενίσχυση του τελευταίου (Μουρούτη – Γκενάκου 1979, 133).

[8] Βούλγαρης 2010, [6r]: «*Ὁ Ἑλλόγιμος, καὶ πάντα ἄριστος Θωμᾶς οὗτος ἦν ὁ Μανδακάσης, ὁ ἀπὸ τῆς ἐν Μακεδονίᾳ Καστορίας ὁρμώμενος, ἐν δὲ τῇ Γερμανίᾳ ἐκ πολλοῦ διατρίβων. Παιδείας τε τῆς ἄλλης, καὶ φιλοσόφων μαθημάτων εὖ ἦκων, πρὸ πάντων δὲ τῆς τῶν Ἀσκληπιαδῶν ἱερᾶς τέχνης ἀμφιλαφῶς ἐχόμενος, ἣν κἀνταῦθα ἐν Λειψίᾳ τῆς Σαξονίας μετιέναι τε καὶ ἀσκεῖν, ἀδείᾳ δήπου καὶ συναινέσει τῶν Ἀκαδημαϊκῶν ἐπιτέτραπται* (...)».

[9] Μανδακάσης 1766, 437: «*Πολλοὶ ἐπαινοῦν ὑψώνουν, φίλε μου, τὰ δικά τους, / Ἐκεῖνα τὰ αὐτόματα, κι' ἄτεχνα φυσικά τους. / Ἡμεῖς δὲ τὸν ποιητήν μας, καὶ θεόν μας ὑψοῦμεν / καὶ τὴν δοθεῖσαν ὑπ' Αὐτοῦ, μάθησιν ἐπαινοῦμεν*». Βλ. Ζάττας 1984, 56.

[10] Μανδακάσης 1760, 13: «*καὶ μάλιστα ἡ θεία καὶ προσκυνητὴ καὶ φιλάνθρωπος καὶ εὐεργετικὴ μεγαλειότης, ὅλους ἡμᾶς τοὺς ἀνθρώπους διὰ τὴν μάθησιν, καὶ γνῶσιν, καὶ ἀγάπην, καὶ ἀπόλαυσιν τῶν πραγμάτων μᾶς ἐποίησε*».

ερευνά τη φύση όλων των πραγμάτων, με απώτερο σκοπό να συγκροτήσει την αληθινή ευδαιμονία, την οποία ο άνθρωπος δύναται να απολαύσει επί της γης (Τεμπέλης και Θεοδώρου 2015, 174-178). Έτσι, η ευδαιμονία αντιμετωπίζεται ως καθολικό αγαθό, που δεν έχει αποκλειστικά υπερβατικό χαρακτήρα. Παρομοίως ο Δάρβαρης (1791, 1, 4) συμφωνεί ότι οι άνθρωποι από τη φύση τους διαθέτουν την έφεση προς την ευδαιμονία και ότι από αυτήν ο Θεός δεν εξαιρεί κανέναν.

Ο Δάρβαρης δεχόταν περαιτέρω ότι η αόρατη θεϊκή δύναμη καθίσταται ορατή στον άνθρωπο, αφού αποτελέσει αντικείμενο της νόησης με τη διαμεσολάβηση των δημιουργημάτων, όπως δίδασκε και ο Απόστολος Παύλος.[11] Αντίστοιχα, κατά τον Μανδακάση (1760, 88, 97, 113, 171, 254, 433), ο «*καρδιογνώστης*» Θεός έχει χαρίσει στον άνθρωπο την ικανότητα να προβαίνει συνειδητά σε συνεχή μελέτη, θεωρία και πράξη, τόσο σε σχέση με τον φθαρτό υλικό κόσμο, όσο κυρίως σε σχέση με τα αληθινά αγαθά, που έχουν θεϊκή προέλευση. Σε αυτά ανήκουν και τα ζωοποιά διδάγματα και τα άυλα νοήματα της χάρης του Αγίου Πνεύματος. Έτσι, η λογική, άυλη και αθάνατη ψυχή του ανθρώπου μέσω της επιστημονικής γνώσης δύναται, μεταξύ άλλων, να βιώσει τη μακαριότητα, την ευτυχία και την ευδαιμονία, οι οποίες σε απόλυτο βαθμό χαρακτηρίζουν τον Θεό. Από αυτήν την άποψη, ο Μανδακάσης επαινεί ιδιαίτερα εξίσου τόσο τους αρχαίους Έλληνες, όσο και τους συγχρόνους του Ευρωπαίους, για την αγάπη τους προς την επιστημονική γνώση και τα οφέλη που προκύπτουν από αυτήν. Με έμφαση τονίζει τις ιδιότητες των Ελλήνων, ισχυριζόμενος ότι «*Έλλην σημαίνει ἄνθρωπος εὔτακτος, ἐλεύθερος καὶ εὐγενής, ἐνάρετος καὶ ἀξιωματικός, σοφὸς καὶ μαθηματικός, ἐλεήμων καὶ εὔσπλαχνος*» (Μανδακάσης 1760, 393). Για αυτές τις ιδιότητές τους, και ειδικότερα για την αρετή, τη σοφία, την ευταξία και τη σεμνότητά τους, οι Έλληνες μετέδιδαν το αίσθημα της ευδαιμονίας και στους βάρβαρους Πέρσες, που γοητεύθηκαν όταν εισέβαλαν στη χώρα τους (Μανδακάσης 1760, 319, 393). Σημαντικότερο όμως είναι το ότι, εξαιτίας του πολύ υψηλού επιπέδου της σοφίας και της γλώσσας των Ελλήνων, ο Ιησούς μίλησε και δίδαξε στην ελληνική γλώσσα, η οποία είναι ευλογημένη από τον Θεό. Έτσι εξηγείται γιατί η Θεία Πρόνοια αξίωσε τους αρχαίους Έλληνες να απολαύσουν τη Θεία Χάρη. Κατά τον ίδιο τρόπο, και οι Νεοέλληνες οφείλουν να καταστούν γνώστες της Θείας Πρόνοιας και να απολαύσουν τα δώρα του Θεού (Μανδακάσης 1760, 330). Το γεγονός αυτό συνδέεται με την ανθρώπινη ευδαιμονία, αφού η ιδιότητα του πιστού Χριστιανού, που εκτελεί τις εντολές του Θεού, συνεπάγεται «*ἄκραν εὐτυχίαν καὶ εὐδαιμονίαν*» (Μανδακάσης 1760, 89, 440).[12] Όλα

[11] Γενικότερα για τις φιλοσοφικές και παιδαγωγικές αντιλήψεις του Δάρβαρη, βλ. Δελλής 2014, 328-341.
[12] Πβ. Μανδακάσης 1766, 439: «*Τῶν θείων Σου γὰρ ἐντολῶν, μόνη ἡ ἐργασία, / Εἶναι ψυχῆς μας ἡ χαρά, καὶ ἡ εὐδαιμονία*». Ειδικότερα για όσους τηρούν τη δεκάτη εντολή, η θέση του Μανδακάση (1761, 43-44) είναι ότι «*καὶ μάλιστα οἱ τοιοῦτοι ἀπὸ τὴν ἀπραξίαν τῶν κακῶν καὶ πονηρῶν ἔργων ἔχοντες τὴν συνείδησίν τους*

αυτά βέβαια δεν κατακτώνται εύκολα, διότι ο Θεός επιφυλάσσει για τους ανθρώπους δοκιμασίες, τις οποίες ο Μανδακάσης (1760, 440) αποκαλεί χαρακτηριστικά «*ὀνειδίσματα*», «*φοβερίσματα*» και «*ξυλίσματα*». Όταν, όμως, τελικά επιτευχθεί η ευδαιμονία, τότε αυτό αναγνωρίζεται και από τους άλλους ανθρώπους, και αν η ευδαιμονία αφορά ένα ολόκληρο έθνος, όπως το ελληνικό, τότε οι Έλληνες καθίστανται για όλους τους άλλους λαούς «*σεβάσμιοι καὶ χρησιμώτατοι καὶ ὠφελιμώτατοι καὶ ἀναγκαιότατοι*». Ο Μανδακάσης δεχόταν ότι όποιος έχει επιτύχει για τον εαυτό του την ευδαιμονία οφείλει μέσα από την επαφή του με τους άλλους να τη διδάξει παντού, προκειμένου αυτή να καταστεί κτήμα και άλλων ανθρώπων. Παρομοίως, ο Δάρβαρης αντιλαμβάνεται ότι σκοπός της ζωής είναι η αρετή και η ευδαιμονία και ότι στην επίτευξή του βοηθά ριζικά η παιδεία (Δελλής 2014, 338). Ειδικότερα, φρονεί ότι «*τὸ σχολεῖον εἶναι ἐκεῖνος ὁ τόπος, ὅπου τὰ παιδία μανθάνουσι τοιαῦτα πράγματα, διὰ τῶν ὁποίων δύνανται νὰ γένωσιν εὐτυχεῖς ἄνθρωποι· πράγματα δηλαδὴ ὁποῦ ὄχι μόνον εἰς τὴν παροῦσαν ζωὴν μᾶς κάμνουσιν εὐτυχεῖς, ἀλλὰ διὰ τῶν ὁποίων καὶ εἰς τὴν μέλλουσαν ἀϊδιότητα γινόμεθα μακάριοι*» (Δάρβαρης 1791, 1· Δελλής 2014, 333). Κατ' αυτήν την έννοια, ο Μανδακάσης (1760, 18, 444) πιστεύει ότι ο Χριστιανός, που είναι ήδη ευδαίμων στη διάρκεια του βίου του, έχει κάθε λόγο να βιώνει απερίγραπτη χαρά και αγαλλίαση, όταν εγκαταλείπει αυτόν τον κόσμο.

Ειδικότερα, ο Μανδακάσης εξαρτά την απόλαυση των πραγμάτων από άλλες διαδικασίες και δραστηριότητες της συνείδησης. Όλες μαζί, σύμφωνα με τη χρονική τους διαδοχή, είναι οι εξής: μάθηση, γνώση, αγάπη, επιθυμία και απόλαυση. Ο Μανδακάσης θεωρεί ότι αντικείμενο αυτών των διαδικασιών είναι πρωτίστως οι ιδιότητες του Θεού και η Θεία Πρόνοια και στη συνέχεια τα εκ φύσεως αγαθά. Με τον περιληπτικό όρο «*πράγματα*» δηλώνει ότι εννοεί το σύνολο του ορατού και αόρατου κόσμου και όλες τις δωρεές του Θεού προς τον άνθρωπο, ενώ αντίθετα με τον όρο «*ψευδοπράγματα*» εννοεί όσα συνδέονται με την άλογη, θηριώδη και θνητή σάρκα, από τα οποία ο άνθρωπος οφείλει να απελευθερωθεί, επειδή η σάρκα είναι τελικά ένας ανθρωποκτόνος εχθρός (Μανδακάσης 1760, 55).[13] Έτσι, αν ο άνθρωπος ξεκινήσει με τη μάθηση των εκ φύσεως αγαθών, αλυσιδωτά θα συνεχίσει με τη γνώση τους, την αγάπη γι' αυτά, την επιθυμία γι' αυτά και τέλος την απόλαυσή τους.[14] Αν όμως δεν προηγηθεί η μάθηση, τότε δεν θα υπάρχει ούτε γνώση κ.ο.κ. Σε τέτοια περίπτωση ο άνθρωπος μετατρέπεται σε εχθρό και καταφρονητή των εκ φύσεως αγαθών, τα οποία

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*καθαράν, οὔτε πρόσκαιρον θάνατον, οὔτε αἰώνιον κόλασιν φοβοῦνται· ἀμὴ ἄλυποι καὶ ἀτάραχοι κατὰ τὴν ψυχὴν ὄντες, εἰς τὸ ἄκρον τῆς ἀληθινῆς εὐδαιμονίας εὑρίσκονται*».

[13] Πβ. Μανδακάσης 1761, 30: «*ἡμεῖς τοιαῦτα ἀναίσθητα, καὶ νεκρὰ ψευδοπράγματα νὰ μὴν προσκυνῶμεν*».

[14] Μανδακάσης 1760, 14*:* «*Εἰς ὅλα λοιπὸν τὰ πράγματα προηγεῖται ἡ μάθησις, ἔπεται ἡ γνῶσις, καὶ διὰ τῆς γνώσεως ἀκολουθεῖ ἡ ἀγάπη καὶ ἡ ἐπιθυμία, καὶ διὰ τῆς ἀγάπης καὶ ἐπιθυμίας ἡ ἀπόλαυσις*».

αντικειμενικά δεν γνωρίζουν καμμία εναντιότητα. Η μάθηση και η γνώση είναι κατ' εξοχήν ενέργειες της λογικής, άυλης και αθάνατης ανθρώπινης ψυχής, η οποία ταυτίζεται με την εσωτερικότητα του ανθρώπου και τον στρέφει προς τον αόρατο κόσμο των ρημάτων και διδαγμάτων του Χριστού. Αυτή η ψυχή διαθέτει σχεδόν απερίγραπτες δυνάμεις, ενέργειες, χάριτες και αρετές, κάτι που αποδεικνύεται από τις συνεχείς αλλαγές και εξελίξεις των επιστημών και όλων των πραγμάτων (Μανδακάσης 1760, 40). Προς αυτήν την κατεύθυνση, ο Μανδακάσης έλαβε την πρωτοβουλία να θέσει τις βάσεις για μία εύτακτη και ευμέθοδη μάθηση των ελληνικών γραμμάτων,[15] την οποία θεωρούσε άκρως απαραίτητο μέσο στη διάθεση των ομογενών του για την επίτευξη της ευδαιμονίας, ως θείου δώρου.[16] Στη διαδικασία της μάθησης αφιερώνει και ένα γνωσιοθεωρητικού περιεχομένου ποίημα (Μανδακάσης 1766, 441-444), αποδίδοντάς της κατ' αρχάς όλα τα αγαθά. Με τη μάθηση ο άνθρωπος προστατεύεται από τα στοιχεία της φύσης, αφού με τη γέννησή του δεν γνωρίζει τι μπορεί να τον ωφελήσει και τι να τον βλάψει. Όσα σχετίζονται με την υγεία και τη ζωή προκύπτουν από τη μάθηση. Χάρη σε αυτήν μπορούμε ακόμη να επικοινωνούμε μέσω της γλώσσας, να κυβερνώμεθα μέσα από ποικίλους τρόπους, και, σε τελική ανάλυση, να εξασφαλίζουμε τους «*εὐτυχημάτων τρόπους*». Στη μάθηση ασφαλώς οφείλονται όλες οι εφευρέσεις και οι επιστήμες, της ιατρικής συμπεριλαμβανομένης, θεράπων της οποίας ήταν ο Μανδακάσης με σκοπό το καλό όλων των ανθρώπων.[17] Έτσι, η μάθηση χαρίζει το «*εὖ εἶναι*» στον άνθρωπο, καθώς επίσης και τη δυνατότητα να κυβερνά ολόκληρη την κτίση. Γι' αυτό, ο Μανδακάσης αποκαλεί τη μάθηση «*νοὸς γέννημα*», που χαρίζει στον άνθρωπο την ευφροσύνη, τη χαρά και την τελειότητα.

Γενικότερα, η ψυχή είναι για τον άνθρωπο εκείνο το θείο δώρο, που τον διακρίνει από τα ζώα και τον καθιστά εικόνα και ομοίωση του Θεού. Ασφαλέστερη γνώση και κατά συνέπεια απόλαυση προκύπτει όχι για τα αντικείμενα των αισθήσεων, δηλαδή τον ορατό κόσμο, αλλά για τον αόρατο, ο οποίος είναι αντικείμενο ακριβούς στοχασμού. Προς αυτόν ακριβώς τον σκοπό ο άνθρωπος διαθέτει τη σάρκα για να λειτουργεί σαν ένα «*προσωρινὸν ὄργανον καὶ μικροσκόπιον*», που θα επιτρέπει στον άνθρωπο κατά τη διάρκεια του βίου του να γνωρίζει τη δύναμη του Θεού και να Τον θαυμάζει.[18] Όσο η ανθρώπινη ψυχή δεν απολαμβάνει τη γνώση των άυλων, αοράτων, άφθαρτων και

[15] Μανδακάσης 1761, 3: «*διὰ τοῦτο ἠθέλησα ἐγὼ εἰς μίαν τοιαύτην καλὴν τάξιν καὶ μέθοδον νὰ βάλω τὰ πρῶτα μας γράμματα*».
[16] *Ό.π.*, 7: «*ἄγκαλα ἡ καλὴ παράδοσις τῶν γραμμάτων ὀλίγον κόπον ἔχῃ, μισθὸν ὅμως πολύν, καὶ στέφανον ἄφθαρτον ἀπὸ τὸν ἐν ὑψίστοις Θεὸν ἀπολαμβάνει*».
[17] Μανδακάσης 1757, [1]: «*ἰατρὸς καὶ ὑπηρέτης τῆς ὑγείας ὅλων τῶν ἀνθρώπων*».
[18] Σύμφωνα με τον Μανδακάση (1760, 41), η σάρκα «*ἐδόθη εἰς ἡμᾶς ὡσὰν ἕνα προσωρινὸν ὄργανον καὶ μικροσκόπιον, διὰ νὰ βλέπωμεν ἐν ὅσῳ εἴμεθα εἰς αὐτὴν τὴν πρόσκαιρον ζωήν, καὶ νὰ γνωρίζωμεν τὴν ἄπειρον δύναμιν καὶ σοφίαν, δι' ἧς ὁ Θεὸς ὅλην τὴν ὁρατὴν κτίσιν καὶ ἡμᾶς ἐποίησε, διὰ νὰ θαυμάζωμεν ἐκεῖνον τὸν ἕνα καὶ μόνον δυνατὸν καὶ σοφόν*».

αθάνατων πραγμάτων, τότε δεν μπορεί να βρει την ευδαιμονία σε ο,τιδήποτε είναι ατελές, υλικό και φθαρτό, διότι από αυτά βιώνει κυρίως αγανάκτηση, ταραχή και λύπη. Συνεπώς, το περιεχόμενο της λογικής και άυλης ψυχής οδηγεί στην απόλυτη ευδαιμονία της και αντίστοιχα το περιεχόμενο της άλογης σάρκας οδηγεί στην άκρα δυστυχία της.[19] Όπως ο Μανδακάσης δέχεται ότι η λογική και άυλη ψυχή προσπορίζει στον άνθρωπο την «*ἔνθεον ἐπιστήμην*», η οποία συνιστά και υποχρέωση κάθε Χριστιανού, για να τη μάθει, να τελειοποιηθεί δι' αυτής και να την απολαύσει,[20] παρομοίως και ο Δάρβαρης, επηρεασμένος από τις ίδιες ιδέες του Διαφωτισμού, ταυτίζει τη γνώση με την ευτυχία (Δελλής 2014, 330).

Σχετικά με την πρόοδο των επιστημών στην Ευρώπη κατά την εποχή του, ο Μανδακάσης (1760, 392) αναγνωρίζει ότι οι επιστήμες και οι τέχνες βρίσκονται σε άνθηση και ότι αυτό το γεγονός, όπως γράφει χαρακτηριστικά, αυξάνει τα πλούτη των ανθρώπων. Ο ίδιος, άλλωστε, στη διδακτορική διατριβή του (1757, 5) τονίζει ότι ως ιατρός σκοπό έχει να προσφέρει στους συμπατριώτες του «*ὅλα τὰ κέρδη τῶν μαθημάτων καὶ ἐπιστημῶν*», έτσι ώστε αυτοί και την ψυχή τους να ευφραίνουν και το σώμα τους να ωφελούν. Σχετικά με αυτήν την άποψη, ο Μοισιόδαξ διατυπώνει τις παρόμοιες εκτιμήσεις ότι «*Ἡ Εὐρώπη τὴν σήμερον* (...) *ὑπερβαίνει κατὰ τὴν σοφίαν ὡς καὶ τὴν παλαιὰν Ἑλλάδα*» (2004, 330) και ότι «*Μήτε ἐπιστήμη, μήτε τέχνη ἐλευθερία δίδοται, τὴν ὁποίαν οἱ νεωτερικοὶ ἢ νὰ μὴ ηὔξησαν ἢ νὰ μὴ μετεμόρφωσαν πρὸς τὸ ἀκριβέστερον*» (1976, 142). Μανδακάσης και Μοισιόδαξ υπερασπίζονται τη νέα επιστήμη, η οποία είχε γίνει αποδεκτή στη δυτική Ευρώπη, αλλά ήταν πολύ δύσκολο να εγκολπωθεί από ελληνικούς συντηρητικούς πνευματικούς κύκλους, που παρέμεναν ακόμη προσηλωμένοι στις απόψεις του κορυδαλισμού. Συναφώς ο Μανδακάσης (1760, 14) επισημαίνει ότι η πορεία προς την ανθρώπινη ευδαιμονία, στον βαθμό που περιλαμβάνει την αγάπη προς τα πράγματα που την εξασφαλίζουν, γίνεται από την ίδια τη φύση του ανθρώπου, ενώ από την άλλη δεν μπορεί να επιβληθεί σε κανέναν άνθρωπο η ενεργοποίηση των ψυχικών δυνάμεών του και η επίτευξη της ευδαιμονίας, αν η ψυχή του δεν ενεργοποιηθεί αφ' εαυτής από τις ιδιότητες και τις αρετές των πραγμάτων. Αν ο άνθρωπος επιλέξει να μη γνωρίσει τα πράγματα, τότε θα στερηθεί της δυνατότητας απόλαυσης των υλικών και μη αγαθών και της συνακόλουθης ευδαιμονίας, ακριβώς διότι τίποτε δεν επιτυγχάνεται χωρίς τη βοήθεια του Θεού.[21]

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[19] *Ό.π.*, 55: «*ὅσα λοιπόν ἡ λογικὴ καὶ ἄϋλος καὶ ἀθάνατος ἡμῶν ψυχὴ δι' ἄκραν της εὐτυχίαν τὰ ἔχει, ὅλα ἐκεῖνα ἡ ἄλογος καὶ θηριώδης καὶ θνητὴ σάρκα δι' ἄκραν της δυστυχίαν τὰ ἔχει*».

[20] *Ό.π.*, 438: «*ἐκείνην λοιπὸν τὴν ἔνθεον ἐπιστήμην ὁποῦ κάμνει ἐπὶ τῆς γῆς τὸν ἄνθρωπον κατ' ἄμφω τέλειον, τὴν ὁποίαν κάθε ἕνας χριστιανὸς χρέος ἀπαραίτιον ἔχει ἐν ὅσῳ εἶναι ἐπὶ τῆς γῆς νὰ τὴν μάθῃ καὶ τὴν ἀπολαύσῃ*».

[21] *Ό.π.*, 17: «*μήτε ἄλλο κανένα ἀπὸ ἐκεῖνα, ὅσα πρὸς τὴν ἐπίδοσιν καὶ προκοπὴν καὶ τελειότητα ἡμῶν ἀφοροῦν, νὰ κάμωμεν χωρὶς ἐκεῖνον τὸν δυνατὸν καὶ σοφὸν ἡμποροῦμεν*».

Συμπερασματικά, οι θέσεις, τις οποίες δέχεται ο Μανδακάσης περί θεϊκής και ανθρώπινης ευδαιμονίας, συνδέονται άρρηκτα με τη χριστιανική συνείδησή του, τη γνωσιοθεωρία του, την ιδιότητά του ως επιστήμονα ιατρού, όπως και με τις απόψεις του για τον ελληνισμό και τον τρόπο διαπαιδαγώγησης των Νεοελλήνων και όλων των λαών, που επιδιώκουν την πρόοδο. Η έννοια της ευδαιμονίας είναι έντονα παρούσα στο εκτενές φιλοσοφικο-θεολογικό του *Σύγγραμμα*, στα προοίμια της διδακτορικής διατριβής του και της *Φυλλάδας* του, αλλά και στον έμμετρο λόγο του. Εικάζεται μάλιστα ότι αποτέλεσε και αντικείμενο της διδασκαλίας του στη σχολή της Καστοριάς, όπου ο Μανδακάσης σχολάρχησε, προκειμένου να ανανεώσει το συντηρητικό πλαίσιο εκπαίδευσης εισάγοντας τις αρχές του Διαφωτισμού. Περαιτέρω έρευνα θα καταστήσει δυνατή τη λεπτομερή ανασύσταση των συστημάτων στη φιλοσοφία, τη θεολογία και την παιδαγωγική, τα οποία ασπαζόταν ο Μανδακάσης, ενώ η κατάδειξη των επιδράσεων που δέχθηκε και εκείνων που άσκησε, θα συμβάλουν στην πληρέστερη αποτίμηση της προσφοράς του στην παιδεία του Γένους.

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προσευχῆς περιέχει καὶ τὰς δέκα ἐντολὰς τοῦ ἐν ὑψίστοις Θεοῦ μὲ μίαν σύντομον εἰς τὴν κοινήν μας διάλεκτον ἐξήγησιν ἐνωμένας. Ἦν συγγράψας, τύποις ἐξέδοτο Θωμᾶς Μανδακάσης Καστοριανὸς καὶ τῇ ἐπιστήμῃ Ἰατρός. Ἐν Λιψίᾳ τῆς Σαξωνίας· παρὰ Ἰωάννῃ Γόττλοβ Ἐμμανουὴλ Πρέϊτκοπφ. ἐν ἔτει 1761.

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# SCIENCE AND RELIGION DURING THE PERIOD OF THE GREEK ENLIGHTENMENT: THE CASE OF BENJAMIN LESVIOS

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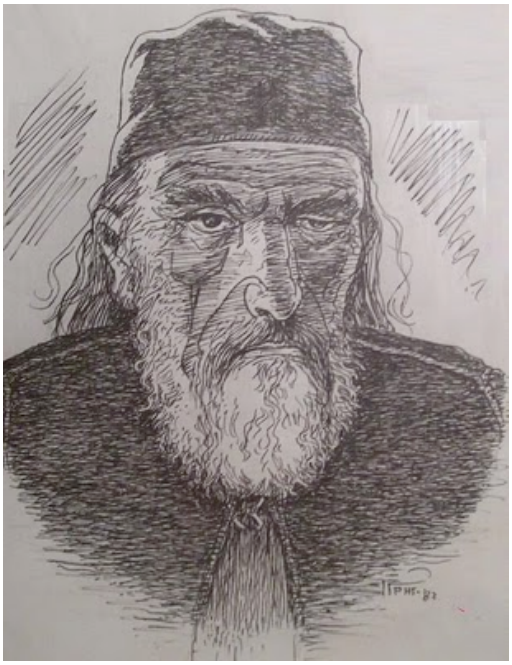
Benjamin of Lesbos or Benjamin Lesvios, as he is known, was named after the place of his origin, Plomari of the island of Lesvos where he was born in 1759. His real name was Basileios Georgantis or Karres.

Benjamin learnt his first letters in his birthplace. At the age of seventeen he went to Mount Athos, where he became a monk. In 1779 he was appointed sacristan of St Nikolaos, a dependency of Mount Athos in Kydonies (Argyropoulou, 1983, 47). He attended the school run by village elder Ioannis Oikonomos for a year, before leaving to study on Patmos, where he remained until 1786. He, then, spent the next three years on Chios, where he studied at the local educational establishment, attending the lectures of Athanasios Parios for a time and meeting the future teacher and prelate Dorotheos Proios, with whom he was to form a close relationship (Argiropoulou 1983, 239).



Benjamin returned to Kydonies and, with Oikonomos's assistance, secured the financial support of wealthy locals for further studies abroad. Thus, around 1790 and at Proios's suggestion, he went to the University of Pisa and then the Polytechnic School of Paris (Argyropoulou 1983, 49). In the French capital he studied, alongside philosophy and the sciences, works by representatives of the European Enlightenment. During the

course of his lengthy stay, he met Korais, whose linguistic theory he adopted, and entered the circle of Greek scholars of the diaspora, later writing articles published in *Logios Hermes*. Having completed his studies in Paris he went to England for about a year, where he visited William Herschel's telescope in Greenwich (Valetas, 1974, 280).

In late 1799 he returned to Kydonies where he settled down to teach at the local school, which, at his instigation, was restructured and renamed the Kydonies Academy. We should note that Kydonies was at the centre of the area to which, at the time we are looking at, the centre of gravity of Modern Hellenism had shifted: the coast of Asia Minor. Smyrna, Kydonies, Chios and Constantinople had replaced the older financial and commercial centres of Epirus and Western Macedonia. Over the course of its twenty-year history, the school became one of the best in the decades before the Greek Revolution, with Benjamin himself as the main teacher of science subjects (1800-1812). He taught courses in Philosophy (Ethics and Metaphysics) and Science (Arithmetic, Algebra, Geometry, Physics and Astronomy). (Argiropoulou, 1983, 239). Some of the necessary experimental regulations and teaching manuals were supplied by Korais in Paris.

Benjamin introduced a modernised education based on the sciences, imbued with the vision of the enlightenment spirit. The physical and mathematical sciences that he taught in Kydonies for twelve years took pride of place in his syllabus, displacing the "good grammatical subjects" and simultaneously opposing the hitherto prevalent view and practice that "the Greek race should spend its whole life on but a single dialect ... and all its upbringing and education should be centered only on grammar" (Lesvios 1818, 85), as Benjamin himself observes.

A philosophical and epistemological trend-setter, Benjamin, as scholarly as he was creative, left behind him a work which, although intended for school use, is important in itself for its rejection of dogmatism and for the emancipation of human thought. This work embraces the whole field of knowledge, according to the semantic meaning of the world 'philosophy' in the Enlightenment: metaphysics, gnoseology, linguistics, cosmology, natural theology, ethical and political thought, paedagogical ideas. This thematic division of his philosophical thought is set out in his actual works, published or unpublished.[1]

It is worth mentioning that 30 mathematical manuscripts and 18 manuscripts on Physics survive. This means that Benjamin's works, whether published or not, were

[1] Benjamin's published textbooks are the following: *Elements of Arithmetic* (Vienna 1818), *Elements of Euclidean Geometry* (Vienna 1820), *Elements of Metaphysics* (Vienna 1820); Manuscripts: *Elements of Physics*, *Elements of Algebra*, *Elements of Ethics*, *Trigonometry.*

used as teaching handbooks in the schools at which he taught, rather than circulating exclusively in teaching circles, as was the case, for instance, with Theotokis' s *Physics*.
In 1812 Benjamin rejected an offer to become head of the Patriarchal School of Constantinople. After a failed attempt to establish a school in Mytilene (EEE 1983, 239) and his refusal to assume the running of the Athonite School, now renamed the School of Kuruçesme, in 1817 he accepted the invitation by Ioannis Karatzas, ruler of Wallachia, to restructure the Academy of Bucharest (EEE, 1983, 239]. His teaching, however, was interrupted by the fall of Karatzas in September 1818, when Lesvios was forced to move to Iasi. He was to remain in Moldavia for the next two years under the protection of Prince Alexandros Kallimachis, during which time he became a member of the Philiki Etaireia (Valetas, 1974, 288). His teaching activity would henceforth be combined with emancipation efforts.

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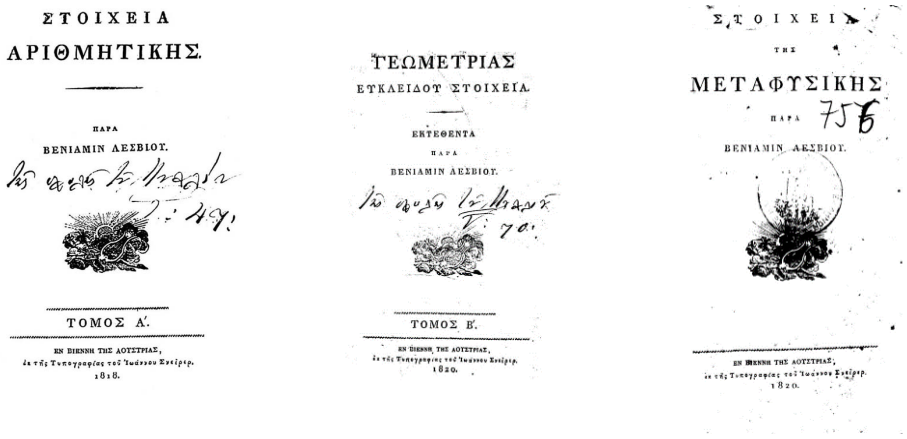
In September 1820 we find him in Smyrna teaching at the Evangelical School, while simultaneously acting as spokesman of the Philiki Etaireia (EEE 1983, 239]. From the summer of 1821 to September 1824, when he died of typhus in Nauplion, he would devote himself to the cause of the Greek Revolution.

Benjamin's views on education, which he implemented throughout his teaching career, are detailed in the speech he gave on 18 January 1818 in Bucharest, when he assumed responsibility for the restructuring of the Academy of Bucharest. The speech was published in the 1818 issue of *Logios Hermes* (*Logios Hermes* 1818, 200-209). The scholar's views on education generally and scientific education specifically are made clear by a selection of extracts from that speech and also from his works *Elements of Arithmetic*, *Elements of Euclidean Geometry*, *Elements of Metaphysics* and *Elements of Ethics.*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ΤΟΜΟΣ Α'.
ΕΝ ΒΙΕΝΝΗ ΤΗΣ ΑΟΥΣΤΡΙΑΣ,
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ΓΕΩΜΕΤΡΙΑΣ
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ΕΚΤΕΘΕΝΤΑ
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ΜΕΤΑΦΥΣΙΚΗΣ
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ΒΕΝΙΑΜΙΝ ΛΕΣΒΙΟΥ.
1820.

"In order for a man to become a man, he must receive upbringing and education, and then he will be a God-created animal on earth, otherwise he will be a worse beast that bears and lions, or a vicious brute" (*Logios Hermes* 1818, 201). In the unpublished *Elements of Ethics*, drawing the connection between education and human happiness in the context of the state, he notes: "Where there is progress of the arts and sciences, there lie wealth and power, and where the arts and sciences are lacking, there lie poverty and misery" (Sotirakis 1939, 48) (*Logios Hermes,* 1818, 202). When setting out his views on human beings in his work *Elements of Metaphysics*, he believes Man to be the creation of God in His image, according to reason and free will. He also uses the Aristotelian term "in potentia" to say that Man "was left to upbringing and education to make him rational in fact" (Lesvios 1820, 103-104). In other words, upbringing and education are the way by which people will become actually rather than potentially rational, and, of course, also virtuous.

Benjamin's scientific thought is expressed systematically, adapted to Greek circumstances, in simple terms to make it comprehensible to ever more people, while always preserving a steady dividing line between it and the scholastic tradition in the teaching of Philosophy and the sciences of his time. Although his *Physics* was never published, it had entered contemporary thinking on the subject. This is proven by the multitude of surviving manuscripts, and is due to the fact that it bears an optimistic message that troubled his opponents and played an important part in the shaping of contemporary scientific thought in Greek territory (Karas G. 1982, 232).

Now, the story of his altercation with the representatives of the Greek Orthodox Church, which was even named "the Benjamin Affair", is roughly as follows:

The protagonist in this affair was, as is evidenced by his letters, Dorotheos Voulismas. He was not a scholar in the sense prevalent at the time, meaning someone who expresses human relationships with education. His main work was preaching, a service to which he devoted around thirty years, the most important of the Modern Greek Enlightenment. He was educated but specialised in dogmatics. The Church had repeatedly asked him to opine on relevant matters and his opinion carried weight (Aggelou 1998, 261)[2].

Voulismas often enjoys playing the role of spiritual guide, advising Benjamin to be wary of "bitter and murky waters", in a clear reference to Gabriel, a teacher at the Evangelical School of Smyrna, whom he accuses of thinking differently.[3] Some years later, in 1815, Voulismas will accuse the scholar Stefanos Dougas of being a heretic, as, according to him, in Dougas' book *Investigation of the Nature*, the spirit had a material existence ("lacking spirit, he speaks of spirit…"). Dougas was forced, then, to make a confession of faith (Camariano-Cioran, 1974, 653-655).

Voulismas, however, did not play this part without the blessing and support of a close friend, who, although not a resident of Constantinople, acted as though he lived in the Patriarchate itself. This was Athanassios Parios, a major scholar of the period, who had been established on Chios for some time as head of the School there, his teaching and writings influencing the whole of Asia Minor. He had close links with the Patriarchate and could easily be said to direct its policy in educational matters. He expressed the views of the conservative side of the Church, and his intense aversion to the West brought him into conflict with the spirit of the Enlightenment.[4] With the

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[2] Born on the island of Ithaca before the middle of the 18th century, he soon left for Asia Minor, where he studied under Ierotheos Dendrinos in Smyrna. By 1770 he was a monk of the Holy Sepulchre and the following year he served at the dependency of the Holy Sepulchre in Constantinople. He preached in the churches of Constantinople and toured mainland Greece over the next few years. There followed a period of some years during which he toured Europe, mainly Austria, Hungary and Germany, where he published Nicephoros Vlemmydes's *Logic* together with a few other works. Around 1790 he returned to Constantinople and was appointed a preacher of the Patriarchate. From then until his death in 1818, he attempted various journeys to Russia, but his centre of activity was always Constantinople.

[3] Gabriel from Vrioula in Smyrna, a teacher at the Evangelical School of Smyrna.

[4] Athanassios Parios was born in 1722 in the village of Kostos, on the island of Paros, where he received his instruction in "common letters". Desiring higher education, he went to Smyrna, to study at the Greek school of the city, which was founded in 1717 and was later named the Evangelical School. He resided in Smyrna for six years. In 1752 he went to Mount Athos and enrolled in the Athonite School, where he studied under Neophytos Kausokalyvites and Eugenios Voulgaris. In 1770 he became schoolmaster of the Athonite School. In 1776 he was condemned as a heretic and excommunicated by Patriarch Sophronios II and the Holy Synod of Constantinople. But in 1781 he successfully defended himself before Patriarch Gabriel IV and the Holy Synod, and restored to communion and the priesthood. During the years 1788–181 he served as the schoolmaster of the School of Chios. At the age of 90, he withdrew to the cell of St. George of Reusta and died there on June 24, 1813. He is the author of theological books including:

1785 - *Antipope*, (in which he analyses the work of Saint Mark of Ephesus)

1797 - *Paternal Teaching* (written by him, but published under the name of Patriarch Anthimos of Jerusalem).

1798 - *Christian Apology*

1787- *Rhetorical Pragmatics* and *Metaphysics*

flourishing of the Kydonies School, Parios saw the Chios School losing students who were attracted to Benjamin, and consequently his own influence being eroded. And, furthermore, Parios saw Orthodoxy as being threatened by the West. During this period, he was writing ceaselessly on this issue, which was to worry him deeply throughout his life. A few years earlier he had intervened in Voulgaris's contretemps with Psalidas, accusing the latter; shortly afterwards, in his work *Response*, he became deeply involved in the subject, coming into conflict with Korais (Aggelou 1988, 264). And in 1802, in the same work, Parios wrote that "in those years, anyone who set foot in Europe was, without further examination, an atheist… mathematics was the source of atheism, the first result of which was breaking the fast", and referred to the Western mathematician Varlaam Kalavros as insane (Parios 1802, 50, 68-70).

However, in Benjamin's case it was neither the Mathematics nor the Physics teaching that annoyed Parios. The issue was a much narrower one, a cause célèbre of the time: it concerned the movement of the Earth and the habitation of the planets (Aggelou 1988, 264). We know that the Orthodox Church had, for centuries, accepted the geocentric cosmological system, which harmonised with theological affairs. Let us not forget Sergios Makraios, who, on reading Kodrikas's translation of Fontenelle's *De la pluralité des mondes,* attempted to refute the Copernican system in his work *Trophy from the Greek Panoply* (Vienna 1794). Parios would not permit any questioning of the Old Testament, and, of course, anyone expressing a differing view must be an atheist. Benjamin not only held that the Earth moved and that the planets were inhabited, but also criticised "men of small notions", who, he said, "when they are unable to resist an educated man by natural means, set aside natural weapons and take up divine arms". He also states that "human self-regard and lack of understanding, and no other, are the reason for the immobility of the Earth" (Stefanides 1926, 51). Benjamin, also, asserted that the existence of upper forms of life outside the Earth is compatible with the Divine Logos. The opposition to this idea according to him, seems to be selfish, as the people who reject it, cannot bear the possibility that there might be others with whom they would share the Divine Inheritance (Lesvios 1801-1805, §202,203).

As Lesvios notes, Parios "did not cease from sending unsigned letters against both myself and the school" (Aggelou 1988, 266).

A small circle of scholars had formed around Parios and Makarios Notaras, the former Metropolitan Bishop of Corinth, a well-known "Kollyvas". These scholars were influenced and guided mainly by Parios. Some of them, including two persons named

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1802 - *A Response to the Irrational Zeal of the Philosophers Coming from Europe*

1806 – *Epitome* (a theological textbook, the fruit of the collaboration with Saint Makarios of Corinth) (Sathas 1868, 630 – 642)

Samuel and Iakovos, made false accusations against Benjamin, which reached the Patriarchate. The decision of the Synod in October 1803 condemned and humiliated Lesvios. Among other things, he was forbidden to teach the Copernican cosmological system and the habitation of the planets (Aggelou 1988, 269). The synodic decision was drawn up and probably instigated by Dorotheos Voulismas. The ulterior motive of this persecution was to remove Benjamin from Kydonies. When, however, Iakovos and Samuel arrived in Kydonies as executors of the synodic decision, the Kydonians rose up and expelled them from the city on the spot. The bourgeois and commercial classes, who had created the School and respected Lesvios, were not inclined to accept interventions in the education they honoured and respected, believing in its value (Aggelou, 1988, 272-274). Dionysios Kaliarchis, Metropolitan of Ephesus, a cleric of progressive ideas, sided with Lesvios in this affair. Obviously Benjamin did not leave Kydonies at this time, but stayed and continued his educational and scientific work.

This small mutiny of the Kydonians, perhaps unparalleled in the history of education, could not have occurred without the direct support of the centre, Constantinople; in other words, without support both within the Synod and among the Phanariot rulers of the City (Aggelou 1988, 273). The letters that the Kydonians sent to Constantinople shed light on the motives of Benjamin's accusers, and Parios and his accomplices were now openly accused of acting through jealousy. Indeed, the Synod, acting against the wishes of the Patriarch, would later (in 1804) dismiss Voulismas from his post. One of the arguments presented by Benjamin in his defence to the Synod was the fact that the Church had not condemned Nicephoros Theotokis, who had presented the Copernican system in his work on Physics, albeit as a "minor hypothesis"[5]. And when, in May 1805, Dionysios visited Kydonies to investigate the matter, in line with the synodic decision, Benjamin defended himself, widening the issue on which he stood accused from the heliocentric system to his general teaching of Physics. He says that "All the concepts of Physics, as we know, are nothing but simple conjecture...", so it would be completely illogical to accept and teach all the contradictions of Physics as dogma. And regarding the teaching of Mathematics he says, "I am not an instructor of theology, but mathematics and natural sciences, therefore there cannot be blasphemy in Mathematics as a science, even if the instructor is the worst of human beings"[6] (Gedeon 1976, 120).

[5] A fundamental element in Theotokis's lawfulness was his cautious attitude toward the theory of the heliocentric system. In his *Physics*, published in 1766, he presented the heliocentric system. Yet the expressions he used, e.g. "they hypothesize that the earth moves" and "weak hypothesis", which placed the Copernican system in the sphere of hypothesis, as well as his scientific repute, provided support for several opponents of the heliocentric system, which was fought against by the Church.

[6] See M. Gedeon, (1976) p. 120. Gedeon mentions that "Benjamin, incessantly subjected to machinations and accused of atheism by the Church, came to Constantinople, in order to defend himself in person against hateful slander, and proved beyond doubt the purity of his faith".

Thus, in his response, Lesvios stated a truth which the Patriarchate, hemmed in by fear and prejudice, could not conceive.

The Benjamin affair eventually blew over, but as a letter from Konstantinos Nikolopoulos to Schinas, dated 24 March 1806, notes, "the school of the Kydonians in Asia Minor progresses, where Benjamin Lesvios teaches, whom Athanassios Parios and the preacher of the Great Church Dorotheos of Ithaca do not cease from slandering to the Great Church and others and persecuting …" (Karatzas 1948, 19).

In both 1808 and 1810, the Kydonians asked Theophilos Kairis, who was studying in Paris, to replace Benjamin, saying that he wished to leave the School due to problems with his eyesight. Kairis refused and Benjamin continued to teach. In fact the Kydonians probably wanted to restore peace and quiet to the School, which had been troubled by the stir caused by Lesvios's teaching in the past (Aggelou 1988, 284). Whatever the reason, the truth is that although Lesvios continued to teach until 1812, there was now a deep rift between him and the Kydonians, as is clear from a letter of his in which we read that the latter "without wasting time demand the nullification of the efforts by which men have appeared in the world". The confrontation even led to the persecution of his students.

We do not know the reasons for this conflict. The hypothesis that it must be due to Benjamin's opposition to Kairis, who had been teaching at the School since December 1811, is not enough to explain the deep rift between two people of the same intellectual background living in the long shadow of Korais (Aggelou, 1988, 285).

So, in 1812, Lesvios's teaching career at the Academy of Kydonies, one of the best "modernising schools" of the time, came to an end.

We will now attempt a brief interpretation of Lesvios's confrontation with Athanassios Parios, in effect, since Voulismas was no more than his instrument.

Lesvios was the case of the scholar who, for the sake of broader, multifaceted education, invested a great deal in early-19th-century education throughout his long teaching career. His fertile contribution to Greek educational affairs largely bore out the vision of Korais: the access of Greek education to the humanist Enlightenment education of Europe. His insistent interventions to give new meaning to educational virtues reflected the wider context of the ideological currents of Neohellenism, starting from a comprehensive universal theory of Greek scholarship: the necessary precondition was to release education from its traditional bonds.

Based on these facts, however, two important questions arise. How far did Greek 18th- and 19th-century society need such devices and divisions? Why was the "metakenosis" ("transfusion" or "decanting") of such ideological models necessary in the

wider area of Southeast Europe? The prevailing view is that the "Greek East" had to escape from its exclusive dependence on Orthodox Christianity. However, its cultural self-sufficiency, in the context of which Athanassios Parios saw it, did not need the Enlightenment. His conflict with Benjamin Lesvios emerged from the unceasing processes of regaining and preserving the age-old Byzantine tradition.

A conscientious exponent of patristic authority and a fierce proponent of "Kollyvadic" theology (Mettalinos, 1997, 189-200), Parios condensed in his work all the features necessary for the reinstatement of the liturgical acts of ancient Church tradition. His reference to the teachings of the "God-bearing Teachers of the Church" formed the fundamental starting-point for the promotion of Orthodox spirituality, defined as a cultural counter-proposal to the process of transition to new forms of educational values mainly furthered by Lesvios (Mettalinos, 1998, 401-422). The confrontation between the two teachers of the Greek Nation, through their vituperative writings, may have taken place at the level of opposing views and opinions, but its causes ran deeper. It was based on two radically opposed world-views that functioned by similar methods.

And, if we move on from the specific dispute between Benjamin Lesvios and Athanassios Parios, to look at the wider confrontation between the official Church and the bearers of the Greek Enlightenment, we come to the broader questioning and distrust of the sciences which, as a Western import, were considered a fundamental agent of atheism and a factor destabilizing the dominant order in ecclesiastical, as well as national, affairs. During the century before the Greek Revolution, supporters of both sides, believing in the sanctity of their cause, reached extremes in passion hitherto unseen in the history of the enslaved Greek nation (Dimaras 1983, 307), but essentially, in our opinion, the clash was due to the misinterpretation of each other's intentions.

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# SCIENTISTS' GOD IN THE INDEPENDENT GREEK STATE

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## Introduction

The establishment of the Independent Greek State in 1828 marked, among others, a number of serious changes in the intellectual life of modern Hellenism. To make a long story short, we may argue that the ideals of Modern Greek Enlightenment (Dimaras 2002) (Kitromilidis 1996) which prevailed from about 1750 until 1821 vanished just in a moment. Suddenly, with the eve of the Independence the refreshing climate flourished in the prerevolutionary period went down. Nevertheless the Bavarian administration which ruled Greece at that time under the King Otto, established a University in the new capital of the State, the city of Athens (Gavroglu et al. 2014). Following the German model which used as the general pattern for establishment of all the state institutions, physical sciences in this University remained for the whole 19th century under the umbrella of the Philosophical School. In any case the doors of the University remained hermetically closed for the few last Mohicans, the scholars who remained active after the Independence.

For example Dionyssios Pyrros' candidacy for a post in the University rejected by the Royal Court (Vlahakis 1998), while Theophilos Kairis accused as heretic, as a supporter of theosophy, and finally lost his life while in jail. (Karas 2013).

Under this scene, a new generation of scientists formed gradually. A number of young men have gone to European Universities for studies. Contrary to what had happened with the first wave of this kind of students during the 18th century (Vlahakis 2013), this time these young men studied having in mind not to become scholars with

[1] The research has been accomplished in the frame of the project Narses - Aristeia, National Strategic Research Framework, funded by the European Social Fund, European Union and national Funds. The paper presented during the International Conference on Science and Religion, 3-5 September 2015. The paper is going t be published after its elaboration and enrichment.

the wider meaning of the world, but experts in specific disciplines. Most of them had chosen to study either in Germany or in France, both countries which in 19th century participated in a kind of rally for the best position on scientific achievements.

At the same time, as we know, a relevant reformation had taken place in Europe, where the profitableness of the physical sciences for everyday life overshadowed the philosophical foundations of the theories of physics and chemistry expressed during the course of the 19th century. In other words, silently, science was transformed to a kind of God's blessing for the humanity and religion seemed to have accepted scientific practice as one more argument for the proof of the existence of God.

We must not forget that 19th century was a century of imperialism and positivism, the century that boosted western civilization to all parts of the world. (Vlahakis et al. 2006)

## The Greek scientists

The first important professor of Physics in the University of Athens was Dimitrios Strumbos (1806-1890) (Tampakis 2009). Strumbos had studied near great physicists in Geneve and Paris. He was responsible for the establishment of the first laboratory of Physics in the University of Athens and he acquired a large number of instruments from Paris. In fact Strumbos was a keen supporter of experimental physics and a skillful instrument-maker himself. Some of the instruments he designed, like a compass known under his name, circulated in the European market until the first decades of the 20th century. On the subject we discuss in the present paper Strumbos had expressed his thesis either explicitly or implicitly.

In a speech he addressed to the students the day he undertook the position of the Dean of the University of Athens Strumbos mentioned that contrary to what was happening during the antiquity in the present day physics was completely independent from religion. In fact as he wrote in several occasions he believed that science had as main task the improvement of everyday life, to make the life of people more easy and comfortable, while religion was connected with the development of a moral humanity. In the above paragraph we may trace the well-known western view of the "double truth", a position developed by the Latin Averroists during the Middle Ages.

In this framework he proposed that elementary education had to focus on the moral education of the children based on a scheme where teachers could be also priests. This idea, coming for the past, was a result of the lack of properly trained teachers in the new independent state. (Tampakis 2009) This stance, originally expressed in the

writings of Strumbos, is evident also in the way other Greek professors of Physics and Chemistry saw the relationship between science and God.

Timoleon Argyropoulos (1847-1912) succeeded Strubos in the Chair of Physics. He was a capable experimentalist and instrument-maker as he predecessor and prominent member of the bourgeois society in Athens. In addition he served several years as president of the Parnassos Society, probably the most prestigious intellectual body in Greece during that period.

Anastasios Christomanos (1841-1906) is considered the founding father of modern chemistry in Greece. Born in Vienna, after excellent studies in Germany, he came to Greece and he started to work for the development of chemical education and chemical industry with the same zeal. (Vlahakis 2005).

Both of them have expressed their faith to God in several speeches they delivered in the University and elsewhere. They avoided though, as it was the case with Strumbos, to become involved openly to any discussion concerning the critique of science by religious circles and vice versa.

In fact, God for these scientists had nothing to do with everyday concerns of the people. God was a supernatural Power, with certain characteristics who created the world and set the laws for its proper operation.

Of particular importance as a historical source is the booklet published by Christomanos under the plausible title “Physical sciences and progress” (Christomanos 1896). This programmatic text expresses very clearly the admiration Christomanos had to the powers of science and technology. It was the era of innocence and optimism.

In another address, delivered in 1864, in the University Christomanos described the historical steps of the physical sciences towards their independence as social practice, from the antiquity to his days. In this speech Christomanos criticized the medieval Christianity as a ideological obstacle for the development of science. On the contrary he mentioned that contemporary Church supported fervently the scientific progress. So that, we may claim that the hot discussions we had in the prerevolutionary period concerning especially the philosophical and ideological dimensions of physics kept silent.

But the gradual transformation of natural history to the new science of biology and particularly the emersion of the discussion of the theory of evolution in international level brought afore a new subject for dispute between scientists and religious circles. This discussion took place in different levels and with several means. In fact a small number of professors in the University of Athens supported wholeheartedly the Darwinian theory, either in its original form or in most cases following its German

modification. Among them, we refer in particular to Konstantinos Mitsopoulos (1844-1911), professor of geology and editor of the famous journal *Προμηθεύς* (*Promitheus*), which according to the religious critique of the time imported the materialistic theories from Europe. Though this is true in a great extent Mitsopoulos himself was not a materialist or an atheist.

In an address delivered to the authorities of the University of Athens in 1900 entitled "The geological history of Greece" he expressed his faith to God emphatically. At the beginning he quotes the well-known passage from Genesis: «In the beginning God created the heaven and the earth.
2 And the earth was without form, and void; and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters.
3 And God said, Let there be light: and there was light.
4 And God saw the light, that it was good: and God divided the light from the darkness.
5 And God called the light Day, and the darkness he called Night. And the evening and the morning were the first day.
6 And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters.
7 And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament: and it was so».

According to Mitsopoulos this ultimate truth had been proved by astronomy, which as a science raises the human spirit until the throne of the Creator. Mitsopoulos supported that the universe exists in infinite time and space as the creation continues for ever and without any particular limit in time. A few lines after this confession Mitsopoulos continued with an extravagant enthusiasm to connect natural phenomena with the Divine Power. He considers actually the natural environment as a kind of non-written Bible through which we can feel (the verb is feel and not understand) the ineffable splendor of the Creation.

In another text of Mitsopoulos, published as a response to comments and suggestions given in relation to a book of Geography he had written for the High Schools, Mitsopoulos once again praised the Creation of Cosmos by God but in parallel he mentioned the evolution of the organic matter on the Earth as part of this, endless and laborious creation.

Taking this into account we have to revise our opinion concerning the image of God Mitsopoulos had in his mind. Creation and evolution according to Mitsopoulos are not two opposing and incommensurate procedures. Actually the second confirms the first. I shall not discuss Mitsopoulos arguments in more detail but it is of interest to note that

such ideas are not far away from certain opinions which demand scientific validity even in the present time.

The criticism of the religious circles applied also to the professor of physiology Rigas Nicolaidis (1856-1928), to the professor of Botany Spiridon Miliarakis (1852-1919) and to the professor of physiology Spyridon Dontas (1878-1958).

In addition professor of paleontology and zoology Theodor Skufos (1864-1938) was also considered as a member of the hard core materialists of the time. According to the sources available his students became red because they felt ashamed by the theories and the teaching of this professor concerning the evolution of life on the earth. On the other hand his books were received very well as textbooks in elementary and high schools and he was considered as one of the best scientists of his time.

The case of Skufos as well as of the other aforementioned scientists has to be studied in the framework of the small relevant community in early independent Greece. It seems that two different groups had been formed, one of them having as leader Dimitrios Aeginitis (1862-1934), the powerful director of the Athens Observatory. Aeginitis was extremely powerful in political maneuvers, so that he mutated brilliantly his personal litigation in ideological disputes. There was no doubt, that Aeginitis fraction would succeed in any battlefield from the moment he was considered was friendly to the official church of the time. Besides others he organized the first Academy of Athens in 1926, excluding his rivals, as materialists and scientifically ignorant.

But even in this case, Aeginitis felt the anger of the ecclesiastical circles when he proposed the introduction of the new calendar in Greece. Pavlos Karolides, one of the most pronounced teachers in the Great School of the Nation in Constantinople wrote a fervent libel in order to deconstruct Aeginitis' scientific value. (Karolides 1909)

It is therefore not beyond truth, even with a kind of exaggeration, that Aeginitis' God was a personal God who not by mere coincidence was the same with the God of the official Greek dogmas. This God actually was not a God invented by Aeginitis alone. This was the God who connected the ancient Greek civilization with the revived Greek state in the formation of the ideological amalgam known as Greek-Christian civilization.

This God was the God whom Paul met in Athens during his first visit there, the unknown God. Unknown or known this was the God of the scientists' in 19th century Greece.

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# 1946 DECLARATION OF CHRISTIAN ASSOCIATION OF SCIENTISTS AS VIEWED BY THE EAM'S (NATIONAL LIBERATION FRONT) PRESS. EXAMINING THE CONTROVERSY AROSE OVER THE ROLE OF SCIENCE AND THE RELATION TO RELIGION WITHIN THE CONTEXT OF THE GREEK CIVIL WAR

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At the 1946 Christmas issue of the journal "Aktines" (Rays) a Declaration, which attracted significant attention, was published. It was the Declaration of the Christian Association of Scientists (ChEE). The aim of its authors was to convince Greek people that social life must be constructed upon Christian teachings. According to them, Christianity was identified with "*the Truth, the only one that saves*" mankind ('Declaration', 1946, 7).

In the pages of the Declaration science was presented as being compatible with Christianity. Furthermore, scientific achievements were indicated as proof of religious beliefs and simultaneously a refutation of the materialistic worldview. The latter was considered the main cause for the decline of humanity as it resulted to the refusal of Christianity as the foundation of mankind's existence ('Declaration', 1946, 17-18). Particularly in Greece, anti-Christian fury took the form of mutiny risking the nation's existence ('Declaration', 1946, 21-23). In order to achieve their goals, the authors of the Declaration fiercely attacked Darwin's Theory of Evolution as well as the Freudian Theory of Psychoanalysis, even though the latter was not related directly to materialism.

A Statement, which summarized the aforementioned beliefs, was attached to the Declaration. That Statement was signed by nearly 200 well-known Greek scientists, scholars and artists of that period. Afterwards, the Declaration was published as a book. The Christian Association of Scientists and Zoi (*Life*) Fraternity of Theologians printed 100 thousand copies of it. State mechanisms, such as the Army and the Educational

Institutes, undertook the distribution of the Declaration. According to the magazine 'Spoudastis' (Student) of EPON[1] student branch (S.Ch., 1947, 14), even the Radio Station of Athens advertised the Declaration.

By that time, the Declaration gained significant publicity due to the fact that it served a specific political role. In 1944, after the Liberation of Greece occurred, there was an escalated conflict between the KKE (Communist Party of Greece) alongside its allies in EAM (National Liberation Front) and the bourgeois camp, which was supported by Great Britain and the USA. That conflict led to the outbreak of the Greek Civil War from 1946 to 1949.

During the German Occupation of Greece a major power shift in Greek politics occurred as the vast majority of people of Greece supported EAM, disputing the old – bourgeois – parties. This was also observed inside the Greek scientific community. Even the orthodox clergy was affected. After the Liberation of the country, the upper classes had to deal with that shift. In order to overpower EAM, the official state used terrorism and violence. As a result, thousands of EAM's supporters, especially members of the Communist Party, were persecuted, exiled and executed. Moreover, in 1946, the scientists and scholars, who supported EAM, were dismissed from their positions in Greek Universities. Among them, the famous physicist Achilleas Papapetrou and engineer Nikos Kitsikis, Professors of the National Technological University of Athens, and the geologist Georgios Georgalas, Professor of University of Athens and President of EPON at that time.

Alongside the armed conflict, an 'intellectual war' against materialism and Marxist ideas was declared by EAM's opponents. The Declaration of ChEE was a part of this war, attempting to discredit materialism in the name of both science and Christian religion. Besides, that was not the first time ChEE attacked materialism. During the Occupation of Greece by the Nazi troops the journal 'Aktines' issued a series of anti – materialistic articles (Vlachakis 2005).

At the same time, an article serving a similar objective, was published in the 1st of January 1947 issue of the cultural journal 'Nea Estia' (New Fireside). Its title was “Free intellectuals”, signed by the editor of the journal Petros Charis. He was a writer and literary critic, who had also signed the Statement of ChEE. In that article Charis championed the independence of intellectual activity from politics and organized ideologies (Charis, 1947). That point of view was in direct opposition to the Marxist one,

[1] EPON (United Panhellenic Youth Organization) was the Youth Organization of EAM (National Liberation Front). It was founded during the German Occupation of Greece in 1943. It was outlawed in 1947 but it continued to exist until the early 1950's.

that every form of intellectual activity, such as art and science, is founded upon the material base of society and expresses social interests.

The KKE and EAM immediately responded to that 'act of war'. From December of 1946 to March of 1947 at least 11 articles about the Declaration were published in their newspapers and journals. In those articles there was an attempt to deconstruct both the 'scientific' views and the moral status of the authors of the Declaration and of those who signed the attached Statement.

Actually, this was not the first time the two opposing sides confronted each other. Nearly one and a half years before the Declaration of ChEE, in the June of 1945 issue of the theoretical journal of KKE 'Komounistiki Epitheorisi' (Communist Review) an article entitled 'Old ideas in new form' was published. The author of that article was V. Aggelidis, the regular contributor of the journal about scientific topics around that period. The article was entirely devoted to the activity of ChEE and its journal 'Aktines'.

According to Aggelidis' opinion, popularization of science and "*the familiarization of the wider public with scientific progress*" (1945, 7) was essential for the future of Greek people. 'Official science' was accused of failing in its duty to popularize science. In result, low quality newspapers and magazines filled that void, leaving space for 'Aktines' to 'flourish'. Quoting Aggelidis (1945, 37):

"*The official scowling science looking down on people, seldom condescended to offer some crumbs of 'popularization of science for the people' (...) In this intellectual atmosphere, lacking even a single bit of wider scientific cultivation of the public, the journal 'Aktines' representing a 'Christian Association of Scientists' appeared (...) the main, someone could say the only, purpose of the journal was fighting against materialism"*

The author pointed out that the publishers of 'Aktines' themselves admitted that their main opponent was materialism, which "*was trying to annihilate the (Greek) race" (*Aggelidis, 1945, 38). He indicated that, in order to fight against materialism, the contributors of 'Aktines' used arguments deriving from the Nazi ideology, such as the "*views of Hitlerite thugs of 'anti - materialistic' Physics and Biology, namely Jordan and Bawink[2]" (*Aggelidis, 1945, 38). He also showed that another source of arguments against materialism was the mystic beliefs of the English astronomers sir James Jeans and sir Arthur Eddington (Aggelidis, 1945, 39).

In his struggle against 'Aktines', Aggelidis put forward recent scientific achievements. He accused the publishers of that journal of concealing major scientific

[2] Inside that article two scientists were mentioned. The first one was undoubtedly German physicist Pascual Jordan (1902 -1980), a member of the Nazi Party since 1933 and a fierce opponent of the realistic interpretation of quantum mechanics as well as materialism. The second one, namely Bawink (or Bawing) cannot be identified.

discoveries, when they conflict with their beliefs. For example they wrote nothing about the achievement of "*biologist – chemist Stanley*[3]*, who isolated a chemical molecule of leucoma bearing the qualities of an living microbe, yet it is able to crystallize just like a common chemical body"* (1945, 39), proving that there is no barrier between inorganic and organic matter. But at the same time they kept on arguing that Darwinism has failed according to the 'latest developments in science'.

In conclusion of his article, Aggelidis asserted that the purpose of 'Aktines' was the domination of

"*the idea that science failed as a leading force to discover every mystery and rule over the unknown (…) If man is educated in this way, he will accept passively his submission to the undiscovered and mystic laws that rule his destiny"* (1945, 39-40)

Thus, the publishers of 'Aktines' aimed to persuade the Greek people to submit without resistance to the established order in the name of science.

The publication of the Declaration led the preexisting controversy between the ChEE and EAM to an open confrontation. Only a few days after ChEE's assault against materialistic worldview, the first article, entitled 'Reading a statement', counterattacking the Declaration was published in the EAM - affiliated cultural journal 'Elefthera Grammata' (Free Literature). It was signed by Charalambos Theodoridis, Professor of Philosophy at the University of Thessaloniki. Theodoridis was one of the scholars, who were dismissed from their positions in 1946, because of their involvement in EAM.
Theodoridis was aiming to deprecate the moral status of those who signed the Statement of ChEE. He accused them of hypocrisy and non – Christian attitude (Theodoridis, 1946, 367), because of their collaboration with the Nazis during the German Occupation as well as with the Metaxas dictatorship (1936 – 1940). Most of them actually collaborated with the Occupation troops or with Metaxas regime, hence the accusation against them was true.

Nikos Zachariadis, General Secretary of KKE, launched a full assault against ChEE in one of his speeches in 1947, drawing the line of argument concerning the content of the Declaration. A part of that speech entitled 'The ideological front' was issued in 'Kommounistiki Epitheorisi'. Zachariadis linked the Declaration with the international exploitation of religion by the 'reactionary forces' in order to confront Marxist ideas (1947, 53). He accused ChEE of betraying Eastern Christian Orthodox tradition and values, for they refused reconciliation between the Greek people. According to him, ChEE were faithful to papal preaching, bowing down before "*atomic bomb "Christianity""* (Zachariadis, 1947, 53). He also pointed out the similarity of the Declaration to Nazi

[3] Wendell Meredith Stanley (1904 – 1971), American chemist and biologist

ideology; since they denied modern scientific progress just like Rosenberg in his book "20th century myth" did (Zachariadis, 1947, 53). As a result, the majority of the published articles in EAM's and KKE's newspapers and journals followed a similar line of argument to attack the authors of the Declaration and those who signed the Statement.

In the daily newspaper of KKE 'Rizospastis' (Radical) three articles were published in January of 1947. The first one was entitled 'The 'statement' and the statementists of Aktines', signed by a C. Ferekydis, and was published in two parts in 7th and 8th of January. Inside that article, there were denunciations of certain scholars who signed the Statement, such as Zakythinos, Professor of Philosophy at the University of Athens and Vasileios Aiginitis, Professor of Physics in the same University (Ferekydis, 1947b, 2). A satirical article entitled 'Classified Advertisements', signed by well – known contributor to 'Rizospastis' Apostolos Spilios, satirizing of those who signed the Statement, and an article entitled 'Christian rhetoric', signed by the communist poet and writer Markos Avgeris, followed on 15th and 16th of January respectively.

A small anonymous comment entitled 'Another 'Declaration'' was published in the January of 1947 issue of EPON's main magazine 'Nea Genia' (New Generation). At the same time, two more articles were published in the second issue of the magazine 'Spoudastis' (Student) of EPON student branch. They were entitled 'Today's official 'science'' and 'About a 'statement'' and their authors remain unknown, because they did not use their real names. Three relevant letters under the title ''Statement' and counterstatements' were published in 'Elefthera Grammata' in 15th of January 1947. Two of them were sent by two of those who signed the Statement, namely the author Alkiviadis Giannopoulos and the painter Spyros Papaloukas. By those letters, they tried to dissociate themselves from the political exploitation of the Statement. The third letter was sent by the author Stratis Doukas, a member of KKE and EAM, and it took a position against the justification of the purge against EAM by the Declaration.

There were two articles published in EAM's and KKE's press that differed from the other in terms of the arguments they used. Both of them attempted quite successfully to undermine the scientific validity of the Declaration's content. The first one, entitled 'Scientists and the questions about life without metaphysics' and signed by Ilias Sarantos[4], was published in the double issue (January – March 1947) of the scientific journal 'Antaios'[5]. Firstly, Sarantos pointed out the sociopolitical role of the Declaration.

[4] Probably not a real name
[5] 'Antaios' was published by the EAM – affiliated Scientific Society 'Science – Reconstruction' (EP-AN) from 1945 to 1951.

He claimed that the authors of the Declaration aimed to lead people to confusion and disappointment (Sarantos, 1947, 169).

After a brief introduction, Sarantos directly attacked the scientific content of the Declaration. He focused on the denial of Theory of Evolution by the authors of the Declaration. ChEE refused to acknowledge scientific discoveries, such as fossils of 'Java Man' (Homo Erectus), 'Heidelberg Man' (Homo Heidelbergensis) and Neanderthal (Homo Neanderthalensis), that prove the evolution of human species (Sarantos, 1947, 170). They even referred to German pathologist Rudolf Virchow's claim at 19th century that Neanderthal was an abnormal human being, judging by the shape of his skull[6]. Sarantos correctly indicated that scientists had already proven that the formation of Neanderthal's skull was totally different from Homo sapiens' skull, hence they were different species.

ChEE claimed that human was initially created by God in perfect form, and he degenerated afterwards. That was a pretty convenient assertion for the upper classes, according to Sarantos (1947, 170), due to its obvious social consequences. If that argument was valid, then there would be a category of degenerate people, capable only for manual labour, and another one of born leaders, like Adolf Hitler, as Sarantos provocatively added (1947, 170).

Furthermore, ChEE used that line of reason to interpret history of society. According to that, mankind was more pure and moral at the Middle Ages than nowadays and the latter historical periods were always a product of degeneration of the former. Sarantos (1947, 170) also argued that Darwinism was emerged in a historical period, serving specific social interests of the new ruling class, but it evolved in accordance to scientific progress in total.

Concluding that article, in order to stress the social nature of the conflict between materialism and religion Sarantos (1947, 171) wrote:

"*It is not materialism to blame that Christianity could not become the determining factor of social life. Christian preaching lost its content since revolutionary Christian slogans were used by the Oppressor"*

Giannis Imvriotis, Professor of Philosophy at University of Thessaloniki, wrote a similar article for the journal 'Elefthera Grammata', which was published in the 15th of February 1947 issue. The title of the article was pretty definite: 'Disclaimers of Science'. Imvriotis drew a parallel between the authors of the Declaration and certain Christian orthodox monks right before the fall of Constantinople, as they both "*withdrew from society* to *address similar problems"* of theology (1947, 35).

[6] Creationists use that argument until today, even though it is proven wrong.

According to Imvriotis (1947, 35) the Declaration was "*nothing but polemics against science and rationalism, polemics that send us back to a period full of wild fanaticism".* Its authors were trying to dissociate science from religion in favor of the latter. They denied science the authority of research such matters as the creation of the universe or the immortality of the soul.

In fact, they denied science's potential to research as a whole, since they did not embrace the objectivity of natural laws, quoting English philosopher David Hume. Imvriotis (1947, 35) noted that the authors of the Declaration, following Hume's denial of not only the validity of determinism but that the world exists outside human senses as well, "*shake the foundation of physical sciences, thus they completely annihilate them"*. He also criticized several scientists of his time of holding the same "skeptical" beliefs outside of their laboratories, in contrast to their actual scientific activities.

Imvriotis also repeated Sarantos' arguments against ChEE, concerning their assault on Darwinism. An interesting part of the article is that he revealed a trick used by the authors of the Declaration in order to prove materialism outdated and wrong. First of all, they linked Freudian theory and some exaggerations of that to materialism. In addition, they presented outdated views on both science and philosophy as if they were the modern materialistic perceptions, aiming to dispute materialism in its entirety (Imvriotis, 1947, 36).

## Conclusion

In the conflict between ChEE and EAM's camp, concerning the former's Declaration in 1946, science, religion and politics were heavily interwoven in the context of the Greek civil war. Besides, ChEE was fully supported by the official state and the united bourgeois camp in order to take part in the "intellectual" war against Marxist ideas. EAM and the KKE responded accordingly, aiming to devalue both the ethical and scientific status of the authors of the Declaration and of those who signed the attached Statement. Actually, the social activity of the majority of them during Metaxas dictatorship and German Occupation of Greece supplied many arguments against them.

Further research is needed upon the relation of the whole Greek confrontation in terms of ideas with the international debate of that period about the social function of science and whether science must be organized or 'free'. After Hiroshima and Nagasaki bombings, that debate included social responsibility of science. Two different worldviews faced each other, in the context of Cold War between capitalism and socialism. Aspects of that debate can be traced in Greece, such as Petros Charis' article

defending “intellectual freedom” or articles in 'Antaios' concerning the organised reconstruction of Greece.

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# RELIGION AND SCIENCE EDUCATION: THE THEORY OF EVOLUTION IN GREEK BIOLOGY CURRICULA AND TEXTBOOKS

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## Introduction and Background

In recent years, in parallel with reception studies in the framework of which the reception and appropriation of Darwinism has been examined in the scientific and social spheres of various countries (Glick 1988), a number of studies have been published relating more specifically to the way in which evolution has been 'presented' in the basic education of different countries. And this, primarily through the way in which evolution has been presented over time (or during a specific period) in a country's school curricula or textbooks. Although the methodology adopted in the various studies differs somewhat, it is nevertheless useful to examine them in order to understand how basic education in each country treated and continues to treat the teaching of evolution, for what possible reasons, as well as to pinpoint similarities and differences among them. Thus, from the examination of internationally published scientific papers we note the following:

Although the study of Barberá et al. (1999) refers in general to the biology education curricula of secondary education during the 20th century in Spain, special attention is nevertheless given to the teaching of evolution, "the most sensitive issue in biology education", according to Barberá et al. Among other things, this study provides information about the pressures exerted by powerful social groups in the shaping of curriculum development. It refers in particular to the role played by the Catholic Church in Spain in curriculum planning, as well as in the massive reduction in the time allocated in curricula for the sciences and mathematics when Franco established his dictatorship. The main target of these pressures, according to Barberá et al., was evolution and evolutionary theory, which were never covered adequately in Spanish curricula, even in

the most recent. Also noteworthy is the complete disappearance of these concepts from the 1938 curriculum, as well as the fact that they would not reappear until almost 40 years later. When they were finally reintroduced in the 1975 curriculum, their coverage was very limited, with regard not only to the time allocated for their teaching but also the variety of topics to be taught.

The study on the presentation of human origins and evolution in French curricula of the 19th and 20th centuries (Quessada and Clement 2006) showed that there was a didactic transposition delay between the publication of scientific findings and their introduction in school teaching. This delay was influenced in each period by the conceptions of the curriculum developers, by the education system and, more generally, by the socio-political context.

The results of a comparative study of school textbooks and teachers' conceptions in 14 countries on the origins of humankind (in the context of the European Biohead Citizen) showed among others "great differences between countries (with respect to syllabuses and teachers' conceptions): the social context strongly influences the way evolution is (or is not) taught, particularly human evolution…" "Moreover, in most of the countries where human evolution is taught, the conceptions of teachers who had training in biology are less radically creationist, more creationist-evolutionist than those of their colleagues."(Quessada and Clement 2011).

Carvalho et al (2011) extended the Biohead Citizen study on teachers' conceptions about human evolution to Brazilian teachers and compared with the equivalent Portuguese sample. Results showed "stronger influences of religious values in the Brazilien group as compared with the Portuguese one, though both groups" were aware of the role of natural selection. Also, significantly higher percentage of Brazilians (67.0%) referred God as being in the origin of mankind as compared with the Portuguese (45.5%). and 73.3% of the Brazilians believed in God influence for the creation of life as compared to 49.2% of the Portuguese respondents.

Skoog (1984) studied the (main) text on 'Evolution' in the school biology textbooks of various publishers in the United States. He ascertained a constant increase in the emphasis placed on evolution between 1900 and 1950, a slight decrease during the 1950s, a rise in the evolutionary content during the 1960s and a reduction during the 1970s, which became even larger in the 1980s. According to Skoog, it is possible that the activities of antievolutionists and economic pressures in the market were the main forces responsible for the reduction of evolutionary content in textbooks, with the result that students after 1980 learned less about evolution than their counterparts in the 1960s and 1970s. Apart from Skoog, Rosenthal (1985) too studied the trends in the

presentation of evolution in textbooks during the period 1963-1983 and found a reduction in the evolutionary content of textbooks. However, she considered this to be a characteristic example of avoiding the presentation of controversial topics in high school biology textbooks.

Skoog (2005) also studied the coverage of human evolution in biology textbooks in the United States in the 20th century and found that it fluctuated: During the period 1900-1919, none of the textbooks analyzed had any material on human evolution. In the period 1929-1950 the coverage of evolution was varied, with some textbooks containing brief but straightforward material on human evolution, while others made no reference. The greatest emphasis on evolution during the period 1900-1968 was given in the 1960s, when Biological Sciences Curriculum Studies published three different biology textbooks in which human evolution was presented extensively. According to Skoog (2005), since the late 1980s the emphasis on evolution and human evolution has increased and persisted despite the ongoing efforts of various groups to minimize or weaken their teaching in US public schools.

Swarts et al. (1994) studied the US textbooks of various publishers with regard to the way in which evolution was presented and compared their content with that of Soviet and Chinese textbooks. It emerged from this comparison of US biology textbooks with Soviet and Chinese ones that Soviet textbooks placed emphasis on evolution but neglected certain major topics and devoted considerable text to concepts of an erroneous or dubious nature. In comparison, Chinese textbooks introduced a much smaller number of topics, while US textbooks presented a great variety of evolutionary topics[1].

Our present study is concerned with the acceptance and presentation of evolutionary theory in secondary education in Greece, a country of the European scientific periphery, from the beginnings of the 20th century to date. In other papers of ours we have examined the presentation of evolutionary theory in Greek primary education (Prinou, Halkia, Skordoulis 2009, 2011) as well as in the treatment and presentation of evolutionary concepts in the Greek natural science and biology textbooks (Prinou, Halkia, Skordoulis 2007).

[1] Other studies on the presence of evolution in modern 'Science Standards' in the USA include those of Lerner (2000), Skoog & Bilica (2002), or in textbooks used in Brazil (Rocha et al., 2007) but we shall not extend our analysis to these for reasons of space.
A number of papers refer also to the way and the conditions in which evolution is taught and its conflict with creationism in the USA (Moore 1998 & 1999, 2000, 2004, 2007, Good 2003), in Germany (Kutschera 2008), as well as to creationist teaching in the United Kingdom (Williams, 2008), but nor shall we extend our discussion to this issue in the framework of this paper.

## Research questions and Methodology

1. The introduction and presentation of evolutionary theory in Secondary Education Curricula of Greek schools.

It was deemed necessary first of all to study the 'position' of Biology in Secondary Education Curricula, the subject in which evolution is taught. For this purpose, the present study answers the following questions: When was Biology introduced in the curriculum? How many teaching hours were allocated in the Timetables? What is its relative position among other subjects?

And specifically with regard to the theory of evolution: What did all the Biology curricula envisage and today envisage – since the time the subject was first introduced – regarding the teaching of evolution?

In order to answer these research questions, the following methodology was adopted: Firstly, all the Curricula and Timetables were identified from the beginning of the 20th century to the present day in Decrees (Royal and Presidential) and of these, those which included Biology and introduced changes to its teaching program, as well as the related subjects that were taught prior to – and for a period along with – Biology (Natural History, etc.). The Curricula and Timetables were examined with respect to a) their objective, b) teaching material and c) the teaching time allocated for Biology and related subjects. The quantitative study was conducted by calculating the weekly percentage of teaching hours allocated for each subject relative to the total number of hours in the school curriculum Subsequently, an analysis was made of the way in which 'Evolution' was introduced to each Curriculum.

2. The presence of concepts of biological evolution: a. throughout Biology textbooks and b. specifically in the chapter on 'Evolution' therein.

The research questions that were answered were the following: Which Biology textbooks were published during the entire century? Which was the publishing board of the textbooks? Of these textbooks, which included Evolution? To what extent and in what position was Evolution presented in the textbooks: in a single chapter or were there also concepts outside the chapter on Evolution? What topics were presented in each textbook in the chapter on Evolution, and how much emphasis was placed on them?

To answer these research questions, the following methodology was adopted: Firstly, all the Biology textbooks used in Secondary Education were identified from the beginning of the 20th century to the present day and their content was examined with respect to the existence of evolutionary concepts. The content of the text on Evolution was analyzed.

3. The historical and political context in which the Curricula and school textbooks were produced.

We attempted to explain the gathered data and draw conclusions in the light of the analysis of the historical and political context in which the Curricula and school textbooks were produced, also taking into account factors that may have influenced their shaping.

## Results

The study of Curricula and Timetables as well as of all Biology textbooks used in the 20th century and up to the present day showed primarily the following (sacrificing many details and highlighting the main findings of the study):

Of the Curricula and Timetables in the 20th century, five related to and modified the teaching time (hours) for Biology: these were the curricula and timetables of 1931, 1969, 1979, 1983, 1996/9.

From 1931 to the present, 16 Biology textbooks have been published: of these, 12 had a chapter on Evolution. Two – textbooks for the 7th Grade – referred to the adaptation(s) of organisms. The other two (Senior High School) textbooks had no chapter on Evolution. In greater detail, the study of Curricula, Timetables and Biology textbooks from the beginning of the 20th century up to the present day yielded the following results, presented by period:

### a1. 1931-1969

Biology was introduced in Curricula in 1931, initially as a supplement to the existing natural science subjects of Botany, Zoology and Anthropology in the 2nd Semester of the 10th Grade, i.e. in only one class, a situation that remained unchanged until 1969.

The weekly percentage of teaching hours for Biology in the 1931 Curriculum was 0.8%, for Anthropology 0.8% and for Natural History 3.3%. Overall, the percentage of teaching hours for Natural Science subjects at the time was 4.9%. In the 1931 curriculum the percentage of hours not only for Biology but in general for Science and Mathematics was significantly lower than the teaching hours for Ancient Greek, which accounted for just under 30% of the total weekly teaching hours of the curriculum. This percentage of teaching hours for Ancient Greek began to be gradually reduced in subsequent curricula after 1969. The percentage of teaching hours for Religion has remained more or less unchanged from the 1931 Curriculum up to the present day. It should also be noted that Religion was and is still taught in all 12 grades of Primary and Secondary education.

Among the objectives of teaching the Natural Science courses of all the Curricula from 1931 to 1969 was *the strengthening of the religious and moral beliefs of students through an understanding of nature*, which was also one of the objectives of the Religion course.

The first Biology textbook (T1, Table 1) was published in 1933, by a private publishing house up to 1940 and subsequently (as in the case of all textbooks) by a state agency, the Organization for Publication of School Textbooks (OESB), which was founded in 1937 during the dictatorial regime of General I. Metaxas. According to the preamble of the law establishing the OESB, school textbooks express *the state's perceptions regarding the purpose of education*. In 1969, the regime of the colonels decided to distribute an OESB textbook free of charge to each student, an institution that continues to this day. As can be seen in the relevant Tables, the Organization for Publication of School Textbooks renewed its books only very infrequently.

Its author was the first professor of Biology at the University of Athens, who had studied in Vienna.

This textbook contained a final chapter on Evolution the content of which referred mainly to the evidence for evolution, the theories of Lamarck and Darwin, *the theory of discontinuous variation, Wagner's 'theory of migration', new-Lamarckian theories, new Darwinism, Vitalism and New Vitalism.* At the time the textbook was first published, the theory of natural selection had not yet become accepted and thus the textbook maintained that *according to the latest research, natural selection is not correct* and that *the basis of the Darwinian theory is in conflict with contemporary empirical research*, drawing the conclusion finally that *the problem regarding the way in which species change remains unresolved*. These views also appeared in the last edition in 1951.

While Biology Curricula and Timetables remained the same, the second Biology textbook (Textbook 2, Table 1) was published in 1952 (by the state publisher, as in the case of all other textbooks) and was very similar to its predecessor, which it replaced.
It too contained a final chapter on Evolution with similar content, i.e. referring to the evidence for evolution, the theories of Lamarck, Darwin and de Vries. Although many years had passed since the development of the Evolutionary Synthesis which had been completed by the end of the 1940s, this textbook did still not accept the theory of natural selection. The textbook remained in circulation up to 1976 without being revised, characteristically stating that *the problem as to how creatures evolved has not yet been resolved. Indeed, it is possible that it will essentially remain an unsolved mystery which, as in the case of the mystery of life, man will never be permitted to unveil*. Moreover, the epilogue of the textbook (T2) contained the phrase: "*And the entire world*

*is revealed to us, as a wondrous harmonious whole, an unparalleled work of the divine Creator, all made in God's wisdom*".

**a2. 1969-1976**

In 1969 Biology appeared independently in the timetable and its teaching was introduced to another grade, the final school year. At the same time, both Natural History (Botany and Zoology) and Anthropology were taught as separate subjects και συνολικά μαζί με τη βιολογία ήταν το 3% of teaching hours.

One of the objectives included also the Curriculum in 1969 was that the understanding of nature and the wonder in the prevailing order and harmony should result in "*the strengthening of students' religious beliefs*".

Then in 1969, for the purpose of teaching the subject also in the other grade, a further Biology textbook was published (Textbook 3, Table 1), written by an author who was a senior member of the parachurch organization *"The Savior"* and had written numerous articles for religious publications.

The textbook contained the final chapter "Evolution – The History of Organisms". The content of the chapter covered a wider range of topics than earlier textbooks, but its examination revealed scientific inaccuracies and also made various religious references to God the Creator.

Human evolution was not included in any of the aforementioned Curricula or textbooks.

**Table 1**

| Textbooks - Authors | Location in the Textbook | % pages |
|---|---|---|
| 1933 -1951: 10th Grade | | |
| Textbook 1, *Elements of General Biology, T. Vlissidis* | Last chapter | 21% |
| 1952 -1976: 10 th then 9th Grade | | |
| Textbook 2, *Elements of General Biology, S. Sperantsas* | Last chapter | 19% |
| 1969 – 1976 : 12 th Grade | | |
| Textbook 3, *Lessons of General Biology, I. Economidis* | Last chapter | 19.5% |

**b. 1976-1996**

Between 1976 (post-junta period) and 1996, new Curricula were issued and published for Junior High and Senior High schools in Greece.

The weekly percentage of teaching hours proposed for Biology, Anthropology and Natural History was almost 3% with an additional 2.2% for Biology classes attended only by students who would be sitting examinations for Medical schools etc. (total for Biology 5%).

The objective of the course no longer included "*the development of religious awareness*", but the development of scientific knowledge about evolution.

In this period, four textbooks were published with a chapter on Evolution (Table 2). The textbooks were written by groups of university professors and/or educators.

In two of the textbooks (T6 and T7) of this period, the chapter was the penultimate one, while references to evolutionary theory also appeared in sections other than the specific chapter.

A large number of topics relating to evolution were included in these textbooks (particularly in one, namely T6).

Human evolution was not included in the Textbook. From a letter sent by Professor K. Krimbas, one of the authors of the Biology textbook for the 12$^{th}$ grade of Senior High School, to the press in 1985 (newspaper 'To Vima', 20/1/1985), we are informed that the paragraph that was included only in the first two editions of the textbook and which referred to the scientific views of the paleontologist G.G. Simpson regarding human origin "was deleted without his consent and without his knowledge".

In 1983 detailed content on human evolution was included only in the Curriculum and Biology textbook (T7) aimed at a percentage of students/university candidates (such as candidates for medical school). This textbook also included the hypothesis concerning the origin of life.

| **Table 2** | | |
|---|---|---|
| Textbooks - Authors | Location in the Textbook | % pages |
| 1976-1981: 9th Grade | | |
| Textbook 4 , *Biology Lessons*, *Krimbas etc.* | A short last chapter | 1.6% |
| 1981 – 1999 : 9th Grade | | |
| Textbook 5, *Biology*, *Gelti etc.* | Last chapter | 9% |
| 1977 - 1999 : 12th then 11th Grade | | |
| Textbook 6, *Biology*, *Krimbas&Kalopisis* | Penultimate chapter | 32,50% |
| 1983 – 1999 : 12th Grade Only for candidates for medical schools etc. | | |
| Textbook 7, *Biology*, *Argyris et al.* | Penultimate chapter | 13% |

**c. 1996/1999 – Today**

In the 19-year period from 1996 to 2015, new Biology Curricula were issued for Junior High and Senior High School, the objectives of which include the teaching of evolution.

The weekly percentage of teaching hours proposed for Biology in this period was 3% (absorbing the percentage for Anthropology and Natural History which had been gradually phased out and by 1996 were no longer included in the curriculum), with an additional 1% only for a number of candidates for university schools. Today, the percentage of biology teaching hours is about 4% for all students and about 5% for students who would be taking entrance examinations for Medical schools etc.

In the period under examination, five Biology textbooks have been published with a chapter on Evolution. The textbooks were written by groups of university professors and/or educators (Table 3).

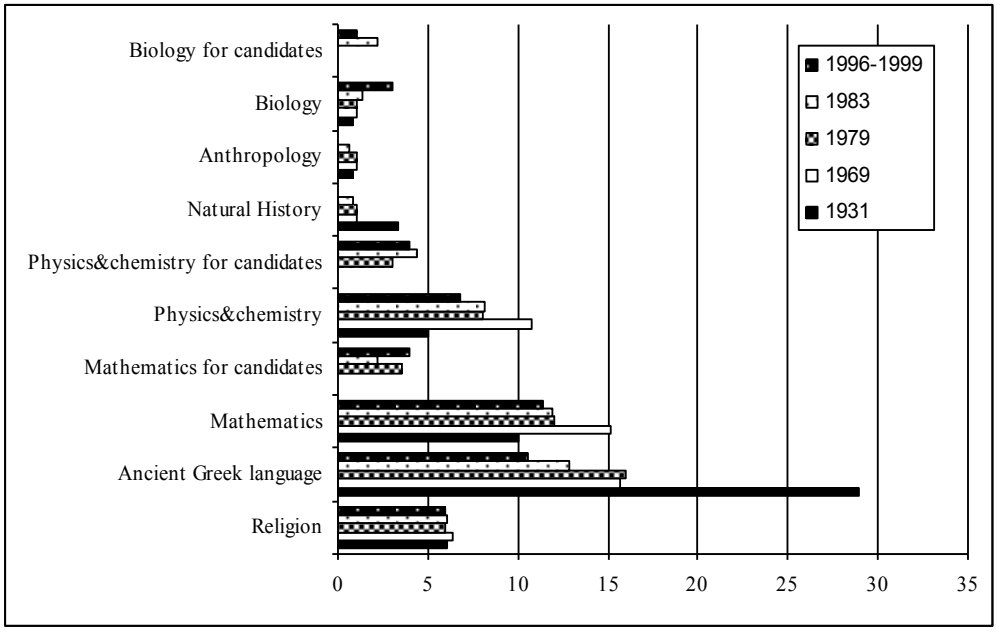
In schools today, two textbooks include a chapter (last) on Evolution: in the 9th grade (Junior High School – Textbook 12) and in the 12th grade of Senior High School (Textbook 11). Both also include human evolution. The content of the chapter in the textbook for the 12th grade of Senior High School covers a large variety of topics.

However by virtue of a decision issued every year, the last chapter 'Evolution' was not included in the material to be examined and was not taught. As a result, the theory of evolution was not taught in any grade of Senior High School up to the school year 2009 - 10. In the period 2009 -15 part of the chapter on "Evolution" was added in the curriculum and since the school year 2015-16 the whole chapter on Evolution including the Evolution of Man has been added.

| **Table 3** | | |
|---|---|---|
| Textbooks - Authors | Location in the Textbook | % pages |
| 1999-2007 : 9 th Grade | | |
| Textbook 8, *Biology* , *Andriotis et al.* | Last chapter | 14,8% |
| 1999- 2001 :12 th Grade | | |
| Textbook 9, *Biology* , *Barona et al.* | Last chapter- *Textbook withdrawn* | 29,40% |
| 2001- 2002 : 12 th Grade | | |
| Textbook 10, *Biology, PEV (Pan Hellenic Union of Biologists).* | First chapter - *Textbook withdrawn* | 31,50% |
| 2002 – To date : 12 th Grade | | |
| Textbook 11 , *Biology*, *Kalaitzidaki et al.* | Last chapter: *The chapter was excluded from the syllabus till 2009. From 2009 to 2015 a part of the chapter has been added in the syllabus while in 2015-16 the whole chapter is included.* | 25,60% |
| 2007- To date : 9 th Grade | | |
| Textbook 12, *Gouvra et al.* | Last chapter | 8% |

**Graph**

**Percentages of weekly teaching hours of Biology and other subjects in Secondary education**



## Discussion and Conclusions

As noted previously, in the new Curricula that began to be applied after 1931 in Greek schools, Biology was introduced not as a separate course but as part of the Natural Science courses. In the USA, Biology had become established as a school lesson since 1907, when the first Biology textbook circulated – "Elements of Biology" – written by a Secondary Education biology teacher (Sheppard & Robbins 2006). Since the early 20th century, Curricula or Biology textbooks have been used in a number of European countries, such as Portugal (Carvalho, personal communication in January 2008), Sweden (Gericke, personal communication in January 2008) and Spain (Barberà et al. 1999). So, in comparison with other countries, the introduction of Biology as a separate course in Greek schools was somehow delayed and the time allocated for its teaching was limited relative to other subjects. This fact is associated with the more general underestimation of the presence of Science in the Curricula. We shall explain below how this is linked to Greece's particular historical past, which influenced the choices made by the dominant political and social forces also with respect to matters of education.

The characteristics of the Curricula, i.e. their markedly classical orientation (Dimaras 1974) and the fostering of religiosity through the teaching of all lessons, including the natural sciences (Koulouri 1988), had appeared since the founding of the Modern Greek state in the 19th century. Education in the schools of the new Greek social order (which existed both within and beyond the country's borders, after independence had been gained from the Ottoman Empire in the early 19th century) was used to build a national identity, one component of which was religion.

However, this perception was not confined to the 19th century but continued and characterized Curricula also in the 20th century – as has been shown – even after 1931 (and at least up to the end of the 1960s) even though the reasons that existed in the first century of the modern Greek state were no longer applicable.

This happened because the dominant political and social forces believed it was still necessary to defend the ideological concoction of 'Hellenic-Christian' culture and any attempt at modernization or emancipation from archaic paradigms stirred fear, being seen as a threat of degrading of religion, disputing of the past, etc. (Patrikiou 2007).

The outbreak of World War II was followed by a period of occupation and a civil war that began in 1946, between the right-wing government and the 'Democratic Army of Greece'. It was then that the declaration of the 'Christian Union of Scientists' was issued, along with the 'Statement by Greek Scientists, Writers and Artists' which targeted anyone who in the name of science challenged the dictates of religion and

threatened the harmonious functioning of society to the benefit of materialistic and atheistic perceptions, such as the Darwinian (Gazi 2004).

The civil war ended in 1949; however its legacy was an intense ideological conflict that culminated in the demonization of anything diverging from the convictions of the victors, anything they believed to be even slightly materialist (Tampakis and Skordoulis 2007).

For the first time in the Constitution of Greece of 1952 the ideological content of teaching in Primary and Secondary education was defined. According to the Constitution, education was aimed "*at moral and intellectual instruction and the development of national awareness among youth based on the ideological directions of Hellenic-Christian culture*". Indeed, in 1954 "The Theory of the evolution of beings", a book written by the president of "Hellenic Christopoliteia", A. Pieriou, was recommended in an Education Ministry circular "to all Education Functionaries, of Secondary and Primary Education, the students of Pedagogical Academies, and the pupils of the final two years of Secondary Education". In the preface of the book, the author wrote: "Bearing in mind consequently that in the last two generations the influence of this theory has been literally catastrophic for the nation, particularly the intellectual classes, … and that the advocates of this theory… continue in the name of Science to undermine what we hold dearest in our holy faith and the Motherland" (Kourouzidis 1999, pp. 24-25).

The Curricula of Greek schools continued to have the orientation described previously (the teaching hours allocated for Natural Sciences were very few, while those set aside for Ancient Greek were far too many up to the end of the 1960s, while the number of hours for Religion was higher and remained unchanged over time). As in the past, the application of these Curricula was aimed at creating and reproducing models based on 'national traditions' and the values of a certain past, rather than the development of relations between man and nature or on the social values of the present (Tsoukalas 1992, Noutsos 1999). The fact that one of the objectives of teaching Natural Science subjects, including Biology, continued – for 40 years – to be the strengthening of the religious beliefs of students in itself illustrates the perceptions of the authors of the Curricula regarding the role and usefulness of scientific knowledge in the lives of students. From the outset moreover, according to Tsoukalas (1992) the permanently close relationship between Church and school – from the founding of the modern state – explains the invariability over time of the percentage of hours for the teaching of Religion and the fact that its teaching was compulsory throughout the entire 12 years of Primary and Secondary education.

Thus, in the context described above, the introduction of a new science lesson of Biology (albeit as the supplement to another lesson) and the simultaneous inclusion of evolutionary theory in the newly introduced Biology textbook in 1933, albeit as the final chapter, which was brief but adequate is considered to be a positive development. This may be attributed to the fact that its author was a university professor. The University was the principal domain of the Greek scientific community and the persons who taught therein were the vehicles for the possible dissemination of the scientific way of thinking (Kritikos 1995).

The introduction of evolution in the first textbook created a "positive precedent" and thus subsequent Biology textbooks contained a chapter on evolution with a similar structure and content. The fact that the second Biology textbook (1952-1976), while closely resembling the first, additionally attributed the miracle of nature to the wisdom of its Creator, is in line with what was mentioned previously about the desired objective of the lesson with respect to the religious instruction of students.

When the country began to develop in the mid-1960s, economic and social conditions necessitated a re-orientation of the education system and its Curricula. It was then that certain changes were introduced and for the first time there was a reduction in the teaching hours for Ancient Greek and an increase in the number of hours for teaching Natural Science lessons. The teaching hours for Religion remained unchanged.

Among the changes in Tertiary education was the establishment in Greece of the first autonomous Biology department in 1967. Then, Biology appeared separately in the school Curriculum, it began to be taught in an additional grade and a new Biology textbook was published (1969 to 1976). Although this included 'evolution', the relevant content was inadequate from a scientific viewpoint and the textbook's author, a member of a Church organization included several religious references. During the dictatorship (1967-1974) the fostering of the 'peculiar nationalist-religious ideology' had reached a peak (Sotirelis 1999). Under the military regime, "an archaeologist, a professor at a Greek University (Ioannina), was dismissed after being accused of teaching the evolutionary origin of man" (Krimbas 2009).

Following the collapse of the dictatorship in 1974, from the period in which democracy was restored in conditions of parliamentary democracy, Curricula began to be implemented that were more modern relative to previous ones, while new Biology textbooks were published with only scientific content. These textbooks contained the modern scientific perceptions about evolution and its mechanisms. Nevertheless, on the one hand, up to the early 1980s, they did not refer to human evolution and a relevant paragraph on this topic was deleted, as we are informed by the author of one of the

textbooks, university professor K. Krimbas, in his aforementioned letter to the press. When the textbook was published, it drew reactions from "religious circles or other fanatical fundamentalists" (Krimbas 2009) over the brief reference in the book to human evolution. As noted by the scholar V. Macrides (1998, p. 204) there has been a plethora of anti-evolutionist polemic from various Orthodox circles, including within the official Church. In his view, religious criticism (of evolutionary theory) has continued to the present, always in an intransigent manner (Macrides 1998, p. 178). One example is the publication of the Apostolic Diaconate in 1996 entitled "Contribution to the closing ceremony for the theory of evolution", along with a number of other publications. "The leaders of the Orthodox Church, as a rule putting forward the argument of 'Hellenic-Christian education', hasten at each opportunity to impose their views with regard to the 'orthodox' orientation of education as a whole and in particular to stigmatize the onslaught of 'atheistic materialism' in schools and the – associated, according to them – teaching (also) of the theory of evolution of species in certain lessons", asserts the researcher into relations between religion and education, Professor G. Sotirelis (1998).
As the study showed, after a period of about 20 years (from 1996) the Curricula and Biology textbooks began to gradually change. While it is considered positive that since 1999 the teaching of evolutionary theory has been included in the objectives of the Biology Curricula:

In the 9th grade (the last grade of Junior High School) it is possibly not taught due to lack of time.

In the 12th grade (the last grade of Senior High School) the chapter on the theory of evolution was removed from the examination and teaching material of biology by virtue of a decision that was issued each year until 2009 -10. The fact that Senior High students were not taught chapter, the same one each year, namely 'Evolution', could suggest that it was not considered to be of much importance for Biology. A similar observation was made by Chuang (2003, p. 673) **in a study made at universities and colleges in the USA (in whose curricula evolution is not included) the students could be getting the message** that evolutionary theory is probably not very important in the study of Biology.

However, if we assume that the theory of evolution was taught in Junior High School, was that sufficient to enable students to comprehend the theory, given that there was no other opportunity to be taught the subject again before graduation? According to the research on the subject (Prinou et al. 2008), pupils graduated from high school in ignorance of what is precisely meant by the term evolution in Biology, and of the main mechanism of evolutionary changes. The results confirmed the observation by

Beardsley (2004) that only one effort to inculcate pupils with the theory of evolution was insufficient for most of them to acquire a working knowledge of the theory.

For this reason, we think that the recent decision to include the teaching of the modern theory of evolution in the 3rd grade of the Upper Secondary School is very positive. We also think that the teaching of evolutionary theory should not be limited in the last two grades but it should be extended throughout the school biology curriculum becoming its backbone.

Academy of Athens member Professor K. Krimbas, while speaking about the reception of Darwinism in Greece in 2009 (during an event for 150 years since the publication of "On the Origin of Species"), referred to fears of the past, fears of anyone who threatened elements of the national identity such as, for example, Orthodoxy. "*It appears that these fears still persist*," he said, concluding his speech.

It is these fears that science and especially evolution threaten religious belief which influence the teaching of evolution in various countries of the world. It is a Greek, but as shown by the obstacles to teaching evolution in the USA, Spain and other countries, also a global phenomenon (IAP Statement, 2006).

Though we are well into the 21st century, it appears that an effort must be made to explain – even today – that evolution is not the flame-breathing dragon of atheism but a theory that explains biological phenomena, that relates bodies of information and guides research (Farber 2003, p.352). The goal of teaching the theory of evolution is that students may understand the theory and recognize that it affords the best current scientific account of the relevant phenomena based on the available empirical evidence (Smith and Siegel 2004), while at the same time appreciating its contribution and multiple usefulness for improving human life – in the same way for example that electricity or quantum mechanics and their applications are taught – and that it is the most useful powerful contemporary problem-solving tool at the disposal of the biologist (Scharmann 2005, p.13). It is not a goal of evolution instruction to convince students to reject their religious beliefs (Smith 1994; 1995, Smith and Scharmann 1999). As research (Bishop and Anderson 1990, Demastes et al. 1995) has shown: students' understanding of evolutionary theory and their ability to use it can be improved without affecting their beliefs. The teaching of evolution must be disconnected from any 'obligation' to answer metaphysical questions, since science cannot answer all questions (Southerland et al. 2001).

In any case, religious belief is a deeply personal matter and can be compatible with the acceptance of Darwinism, as shown by one of the central figures in the shaping of the evolutionary synthesis, T. Dobzhansky and many other eminent scientists (NAS 2008).

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# GREEK STUDENTS OF TODAY DISCUSSING PASCAL'S WAGER

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## Introduction

Discussion on philosophical and religious issues has deep and rich historical links with science; this is particularly true concerning probabilities and statistics (e.g. see Chandler and Harrison 2012; Hacking 1975; Hald 2003; Porter 1986). However, these rich links have been very little explored in the conventional teaching of these disciplines, and even less (or not at all) at an introductory level.

We argue that: (a) With adequate teaching design and implementation, it is possible to explore such links even with novice students in statistics and probability. (b) Exploring such links can be fruitful, both, for the development of students' scientific culture and for the deepening of the discussion with them of the examined philosophical and/or religious issues (see also Kourkoulos & Tzanakis, to appear).

To support (a) and (b) above, we present an example of teaching work concerning Pascal's wager that was realized during an introductory seminar on probability and statistics with Greek students, prospective elementary school teachers.

In the discussion on Pascal's wager, which has been continuing more than three and a half centuries, important elements of scientific culture are involved such as elements of probability theory and of decision theory. Moreover, discussion on Pascal's wager is often linked with the discussion on the limits of the deductive and inductive methods as methods for proving the truth of examined hypotheses, as well as, with the discussion concerning legitimacy of acceptance of hypotheses supported by insufficient evidences (e.g. see Hacking 1972; Hájek 2012; Jordan 1994, 2006). However, many of the arguments involved in the discussion on Pascal's wager, although fundamental, can

be followed without needing a sophisticate scientific background. The later makes these arguments adequate to be accessed by students' like ours; on the other hand, because of their fundamental character they have the potential to raise students' interest strongly.

## Background information and focus

Our teaching work was realized during an introductory seminar on probability and statistics (with classroom meetings 3 hours per week) with 27 4th-year students (25 girls and 2 boys) of our Department of Education.

Students had a high school level background in probability and statistics, so the first four weeks were devoted to revise and complete this knowledge (see below).

The classroom discussion on Pascal's wager lasted the following nine weeks and had a multifarious character. The focus of this paper is to present and analyze main aspects of this discussion, in particular:

- To point out realized connections between mathematical modeling and elements of philosophical reasoning that fruitfully supported both the development of students' probabilistic concepts and the evolution of the discussion on Pascal's wager.
- To point out interactions between students' scientific culture on the role of adequate empirical information and the development of the discussion on Pascal's wager.
- Students were familiar with Orthodox tradition and had received significant influences from this tradition. We present characteristic elements pointing out how their relation to this tradition influenced the discussion on Pascal's wager; both deepening and restricting aspects of the discussion.
- We present elements on how students overcame limitations imposed in the discussion by Pascal's argument based on the danger of loosing eternal salvation and considered the important issue of *the will to believe* concerning doubting persons' motivations for wagering in favor (or not) of God's existence

## Outlie of Course Work

As already mentioned, the first four weeks were devoted to revise and complete students' knowledge in probability and (descriptive) statistics.

Then the teacher gave a first presentation of Pascal's wager and asked students to express their thoughts and comments on this issue; the discussion that followed in this way, lasted four weeks, and constitutes the first part of classroom discussion.

For the second part, the teacher asked students to read an overview of literature on the discussion on Pascal's wager and other relevant reading sources, and to present elements of their personal study in the classroom. The elements presented by the

students substantially enriched the classroom discussion; their discussion lasted three weeks and constitutes the second part of the classroom discussion[1].

In the first part of classroom discussion, and in connection with students' scientific culture, the request for empirical information on the wagering behaviors of real persons that have doubts about God's existence emerged. Students considered this as an important and interesting issue. Some of them had knowledge of stories of friends and relatives that involve elements of such wagering behaviors. So it emerged the idea that by interviewing friends and relatives they may collect such stories, and thus obtain some empirical information on this issue. With teacher's guidance they made such interviews; so the last two classroom meetings of the seminar were devoted to discuss their findings; this constitutes the third part of classroom discussion.

Moreover, the teacher asked each student to prepare a written essay, of at least 5000 words, that should be delivered one month after the end of the classroom meetings and in which they should present and comment both on elements of the classroom discourse and of their personal study concerning the discussion on Pascal's wager. (Alternatively, those who carried out empirical investigation they could focus on presenting and commenting the findings of the interviews that they realized.) [2]

## Teaching on Probability and Statistics

As already mentioned, our students' had a high school level background in probability and statistics. During their tertiary studies they had not followed any course on probability and/or statistics; however, they had some exposure to readings of statistical results in the context of courses on Pedagogy and Psychology.

Students' knowledge in probability and (descriptive) statistics was revised and completed during the first four weeks. We talked about data organization and their (graphically and numerically tabulated) representation, measures of central tendency (mode, median, mean) and variation (range, interquartile range and standard deviation), the shape of a distribution and skewness. We also talked about the probability multiplication and addition laws, the binomial distribution and examples of its applications (e.g. chance games, wagering situations, simple insurance models) and the Low of Large Numbers and the normal distribution accompanied by adequate examples[3]. Moreover we discussed on the concepts of expected value and expected

[1] During these three weeks four meetings of three hours were realized, instead of three.
[2] However students' individual written essays will not be presented in this paper due to space limitations.
[3] In this context Pascal's triangle was also discussed; additionally the teacher mentioned the pioneering role of Pascal in the formation of probability theory (e.g. see Edwards 2002; Hald 2003 ch5). Furthermore, the teacher discussed with students the historical distinction of classical, subjective and frequentist probability (e.g. see Hacking 1975; Hald 2003; Stigler 1986).

utility and on their differences[4]. Using adequate examples the teacher explained that the criterion of maximum expected utility is more appropriate than the one of maximum expected value for making decisions in wagering situations[5].

## The First Part of the Classroom Discussion

### 1 Introduction and initial debate on Pascal's wager

**1.1** During the 5th week, the teacher discussed with students on elements of Pascal's life and work (e.g. see Adamson1995; Hacking 1975 ch7-9; Hald 2003 ch5; Mesnard 1951). Then he gave a first presentation of Pascal's wager[6]. In this context he also mentioned the so-called "many Gods objection" about Pascal's wager.

### 1.2 Many Gods objection

Concerning the "many Gods objection", students agreed that the wager may be meaningless for a person who doubts about God's existence but considers that, if He exists, conflicting hypotheses about Him are probable (e.g. he considers that God may be the Holy Trinity, or the 12 Olympian Gods, or Goddess Kali). Students remarked that in this case it may be impossible for the person to find a coherent behavior that satisfy all Gods that he considers as probably existing.

However, students considered that if a person (a) doubts about God's existence, but (b) still considers that, if He exists, He is an omnipotent, omniscient and omnibenevolent God, then such a person may consider the wager as meaningful.

During the discussion some students remarked that persons believing (a) and (b) above it is more likely to be found in societies with a strong religious tradition, like the Greek society; because in such a society the alternative hypotheses about existing Gods do not find the back up of the tradition.[7]

### 1.3 God cannot be fooled

A second objection expressed by some students is the following: If someone bets his way of living on the hypothesis of God's existence, as Pascal proposes, and lives a virtuous

[4] Usually the concept of expected utility and its differences from the concept of expected value are not discussed in introductory level probability courses. However having planned to discuss Pascal's wager with students, it was a substantial element of preparation to discuss this subject with students.

[5] In this context the teacher also discussed with students at an initial level the Saint Petersburg paradox. (The Saint Petersburg paradox was initially established and treated, in the first half of the 18th century, by Nicolas and Daniel Bernoulli and Gabriel Cramer; e.g. Bernoulli D. 1954; Dutka1988; Martin 2014)

[6] During this presentation the teacher presented also the text of Pascal Wager (in the English translation by W. F. Trotter, in Pascal 1910, 83-87); moreover he mentioned Pascal's *Pensées* and the history of its edition (e.g. see Brunschvicg1909; Descotes and Proust 2011; Lafuma 1954).

[7] Moreover, some students remarked that it would be interesting to have empirical information and statistics about the beliefs of people who doubt about God's existence. The teacher told them that he has no knowledge of such statistical works, but he encouraged them to fill free to look for such works.

life but still conserves doubts about God's existence, then God, as omniscient, will know that he is not a genuine believer and thus this person's efforts will be in vain.

The teacher explained that Pascal doesn't propose the wager to fool God. Pascal believed, he said, that man's heart has the natural tendency to believe in God and the natural ability to perceive that He exists, however because of passions and sins man's heart is blinded and this leaves room for the doubts about God's existence. If one accepts the wager and lives a virtuous life, his heart will be purified from passions and sins and thus his heart will perceive God's existence and his doubts will vanish.

Other students remarked that, additionally, if God exists then the wagering person is not alone in the wager; God is also there and appreciating his efforts He may help him by providing whatever feelings or evidences are necessary for that person to genuinely believe in His existence. Some students remarked that if God wanted to help all peoples to believe in His existence it would be easy for Him to provide them with the necessary evidences, and thus there would not exist atheists or doubting persons, but this is not the case. One of the previous students answered that God helps to believe those who want to believe because he respect men's will; a person who wagers his way of living as proposed by Pascal, clearly makes a very strong effort to dissipate his doubts in the direction of believing in God's existence, and thus it is very likely that he will attract God's help. Other students as well made comments that endorsed this remark[8].

### 1.4 Loving and caring unbelievers

A third objection expressed by some students concerned the idea that unbelievers will lose eternal salvation. They said that an unbeliever who is a loving and caring person and dedicates his life to help his fellow humans, will not lose eternal salvation, in their opinion, because God been loving and just will not ignore the goodness of his heart and his efforts. Other students remarked that the church teaches that being a good person is not enough for eternal salvation; a correct faith is also necessary. However, the first ones persisted in their opinion. Moreover some of them argued that the idea that unbelievers will lose eternal salvation regardless of their goodness is an idea unfair for God, because it presents Him as harsh and intolerant.

### 1.5 Selfish motivation

A fourth objection expressed by students was that if a person that doubts about God's

[8] Moreover, some of them commented that this remark also implies that the wager may be less demanding than the argument of pure heart implies. May be, they said, because of God's generosity, He will help the wagering person to believe once He will consider that he does a strong effort to live a virtuous life and not to wait until his heart will be fully purified.

existence accepts Pascal's wager only on the basis of Pascal's argument, namely because he doesn't want to lose eternal salvation, then he accepts the wager only because of a self-interested motivation, and it is doubtful that God will reward efforts done because of such motivation. A student remarked that in the New Testament eternal hell and eternal salvation are often mentioned as a motivation for people to try to be right and to avoid sinning; so church does not reject such a motivation as a starting motivation for a person to try to ameliorate himself. Some students elaborated on this last point saying that, although such a motivation indeed is not satisfactory, a person that accepts Pascal's wager even on this basis and tries to live a virtuous life, maybe, he will achieve to be gradually liberated from sins and passions; because of this and God's help he may gradually obtain less selfish motivations. Thus even with this unsatisfactory initial motivation the wager may have a positive outcome.

**Comment**

In many of the aforementioned students' remarks and considerations the influence of Orthodox tradition was obvious, as well as their acquaintance with this tradition.

It is also worth noting that some students' considerations reflected an elaborated thinking in the context of this tradition.

## 2. Modeling of Pascal's Wager

**2.1** After the aforementioned initial debate on Pascal's wager, the teacher turned the discussion on its modelling. The following table was presented to the students as a summary of the situation faced by the doubting person in the wager.

**Table1**

| | **God exists (G.E.)** | **God doesn't exist (N.G.E.)** |
|---|---|---|
| | Subjective probability for G.E. ($p_1$) | Subjective probability for N.G.E. ($p_2$) |
| **Wager that God exists** | Present Life1, Salvation | Present Life2 |
| **Not wager that God exists** | Present Life3, Misery | Present Life4 |

The mathematical modeling demands clarification and precise statement of initial premises. This demand leads to reexamine the initial premises established by

philosophical considerations. Often the demanded clarification and precision leads to reconsider or to re-conceptualize initial premises.

In what follows we present examples on how the demand of mathematical modeling for clarification and precision influenced the consideration of initial premises of Pascal's wager.

### 2.2 On the partition of hypotheses about God (columns' partition)

The teacher remarked that Pascal proposed the wager to a hypothetical person doubting about God's existence but considering that if He exists then He is the God as taught by the Christian church, that is, the Holy Trinity. This remark provoked the discussion on the many Gods objection further. Some students remarked that for a person doubting about God's existence and considering that if He exists, the He is Allah, the wager may also be meaningful; and that this holds also for someone who considers that if He exists is an omnipotent, omniscient and omnibenevolent God, without specifying His name and religion. Other students remarked that although the wager may be meaningful for such a person, his efforts may be in vain because he wagers in a wrong faith. Some students answered that, following the church, believing in the Holy Trinity is a condition for salvation only for those who have been properly taught the Gospel; thus for a doubting person that lives in an Islamic society and has not been taught the Gospel this objection doesn't hold. Others remarked that in all these cases, if the wagering person achieves to live a virtuous life and to obtain pure heart then, if the pure heart argument holds, he will perceive that He exists, and with His help he will end up with whatever faith He consider adequate for his salvation; so in all these cases the wager may have a positive outcome.

### 2.3 On the partition of possible courses of actions (rows' partition)

The teacher recalled that Pascal argues that wagering about God's existence is not optional for a doubting person; so he doesn't distinguish between those who don't wager that God exists and those who wager that God doesn't exist.

Some students argued that it would be better if the line "Not wager that God exists" was split into two lines; "Not wager that God exists and live a virtuous life" and "Not wager that God exists and not live a virtuous life". Others considered that it would be better to split also the other line into two; "Wager that God exists and achieve to live a virtuous life" and "Wager that God exist but do not achieve to live a virtuous life".

### 2.4 Reconsideration of the wager about God's existence

These remarks led some students to comment that the wager should be adapted to the beliefs of the different categories of persons that doubt about God's existence. Others students went further proposing that the wager should be personalized in order to be adapted to the beliefs of each person who doubts about God's existence. Many other students made comments endorsing these considerations. Thus, the idea emerged in the classroom that the wager about God's existence should be regarded as personal; and be adapted to each doubting person's considerations and beliefs.

This was an important idea that emerged during the first part of the mathematical modeling work on the wager; that is the clarification of the initial premises of the modeling.

This new consideration of the wager about God's existence was later developed further. In the context of this reconsideration of the wager, Pascal's wagering proposal was considered as a special case that initiates the discussion and as a point of reference for establishing alternative versions of the wager adapted to each doubting person's beliefs.

### 2.5 Other initial premises for modeling Pascal's wager

The teacher told the students that it would be interesting to examine such variants of Pascal's Wager, but after the examination of the initial version; which was done later. Subsequently, the teacher commented that in the wager's text Pascal attributes explicitly positive infinite utility to Salvation ("an infinity of an infinitely happy life", see Pascal 1910, p85), while he is not explicit about the negative utility of Misery. However, he said, Pascal was a devoted Catholic and his hypothetical doubting person considers that if God exists, He is as taught by the Church. Therefore, he said, we may examine first the most severe version of the wager where Misery has infinite negative utility (eternal damnation, eternal hell); this version accentuates the dilemma faced by the doubting person. The teacher also remarked that, according Pascal, all Present Lives (1, 2, 3 and 4) have finite utility value, because they all have finite time and finite pleasures and displeasures.

He also mentioned that $p_1$, $p_2$ are the probabilities that the doubting person attributes to the hypotheses that God exists or not; thus they pertain to subjective probabilities[9]. However, he remarked, at this early time neither the relevant concepts of probability theory, nor the corresponding terminology had

[9] He also recalled that $p_1$, $p_2$ are not 0 or 1 and $p_1 + p_2 = 1$.

been formulated; thus Pascal explains his idea through examples of relevant betting situations. Pascal's examples were also discussed with the students.

### 2.6 Argument from dominance

Subsequently, the teacher remarked that Pascal argues that for the present life wagering in favor of God's existence and living a virtuous life is better and in fact more pleasant than wagering that Gods don't exists and living a not virtuous life. Thus, according to this, the utility value of Present Life2 is greater than the utility value of Present Life4 and the same holds for Present Life1, compared to Present Life3 ($U(PL_2)>U(PL_4)$ and $U(PL_1)>U(PL_3)$). If a doubting person agrees to this then for him it is advantageous to wager that Gods exists in both eventualities (God exists or not).

The teacher also remarked that this argument of Pascal is often called an *argument from dominance*; in the sense that one choice (here, wagering in favor of God's existence) is advantageous (dominates) in all possible eventualities (here, God exists, or not); e.g. see Hacking 1972.

Students agreed that if a doubting person agree with this consideration, additionally to all the previous hypotheses about his beliefs, then it is reasonable that he will consider advantageous for him to wager that Gods exists. However, they remarked that there are too many hypotheses on the beliefs and considerations of the hypothetical doubting person and this makes important the question whether there are such real persons. Some of them also said that many doubting persons may consider such a virtuous life as the one proposed by Pascal, harsh and unpleasant; so, they remarked, perhaps this last hypothesis holds only for very few.

### 2.7 Argument from dominating expectation

Then the teacher remarked that for those who do not agree with the last hypothesis (that $U(PL_2)>U(PL_4)$ and $U(PL_1)>U(PL_3)$) Pascal proposes another argument:

The expected utility of wagering that Gods exists is

$E_1 = p_1 \cdot (+\infty + U(PL_1)) + p_2 \cdot U(PL_2) = +\infty$ (since $0<p_1<1$, $0<p_2<1$)

The expected utility of wagering that Gods doesn't exists is

$E_2 = p_1 \cdot (-\infty + U(PL_3)) + p_2 \cdot U(PL_4) = -\infty$,

so $E_1$ is greater than $E_2$, even if $p_1$ is very small.

The rational choice for wagering is the choice with the greater expected utility[10], which

[10] This criterion for wagering and more generally for making decisions is often called the principle of *maximum expected utility* and it is an important element examined by decision theory. (As Hacking (1972)

in this case is that God exists.

During the formation and the examination of these mathematical equations students:

(i) encountered and worked with infinite expected utilities; which is a concept important both in probability theory and in decision theory,

(ii) encountered, discussed and applied *the principle of maximum expected utility;* which is an important criterion for decision making in decision theory,

(iii) had the occasion to understand that the mathematical modeling of Pascal's wager suggests that a doubting person has to wager in favor of God's existence, even if the probability that he attributes to the eventuality that God exists is very small.

### 2.8 The request for empirical information

Then the teacher asked students for questions and comments on the previously presented elements of Pascal's wager. Many students recalled their previous considerations; that the wager about God's existence should be regarded as personal and be adapted to each doubting person's beliefs. They also remarked that Pascal's wagering proposal is addressed to a hypothetical audience of persons with very specific doubts and considerations about God's existence.

Regarding the aforementioned comments and previous considerations, some students remarked that it would be better to dispose some information about real persons doubting about God's existence concerning questions such as: Are there doubting persons wagering about God's existence? How do they wager? What theirs doubts are? rather than discussing only about hypothetical doubting persons who, also hypothetically, are interested on the wager about God's existence. Others students commented on this, endorsing theirs colleagues' opinion.

**Comment** The request for empirical information appeared early in the classroom discussion about the wager (e.g. see note 7). As the discussion continued the request was repeated and strengthened; however, the development of the classroom discussion is not the only reason for this.

Pascal's wager as part of an apologetic work was supposed to be addressed to real people, aiming to convince them to adopt a way of life for achieving to resolve their doubts about God's existence[11]. Students also saw the wager in this light. On the other

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remarks, Pascal is the first who annunciates this and other important elements of decision theory.) The argument based on this criterion is often called the *argument from dominating expectation*.

[11] The text of Pascal's wager and the whole work of *Pensées* are written with a vivid and passionate style. Moreover, his arguments often appeal not only to reason, but also to feelings and to intuition. These strongly supports that Pascal realized this work not just for provoking philosophical discussion, but hoping to convince real people. This consideration is also supported by his life and interests during the period that he

hand, their scientific culture and education as fourth year students of a Department of Education strongly supported the idea that adequate empirical information is important in the examination of educational, social and psychological issues where real human behaviors are involved. Thus, they transferred and specify this idea in the wager's debate, and this was an important factor that enhanced their request for relevant empirical information.

In response to these remarks, the teacher asked if some of them knew stories about relatives or friends that involved elements of wagering behaviors about God's existence and if they wanted to tell these stories in the classroom. Four of them answered positively and presented in the classroom four stories that they considered relevant. Their colleagues considered that the two of the four stories contained genuine elements of wagering behaviors about God's existence (see brief summaries of these two stories in the Appendix). (For the other two stories students' opinions on this issue diverged.) Students considered these stories to be very interesting and remarked that they point out that there are real doubting persons, who have wagering behaviors about God's existence. However, they observed that the wagering behaviors in the two stories differ from Pascal's wagering proposal concerning motivations, duration and means. Some of them additionally remarked that these differences indicate that real doubting persons wagering behaviors about God's existence are personalized and adapted to their considerations and needs; and that these real elements were in line with their previous considerations about the personalized character of wagering about God's existence.

Considering students' vivid interest on this issue, the teacher proposed that they could try to do some limited empirical investigation on this; namely, to try to collect first-hand real stories by interviewing relatives and friends, who may have relevant experiences. Eight students answered positively and realized such investigation work; discussion on this is in section seven.

### 2.9 Discussing about infinite expected utilities in the wager

The teacher turned the discussion back to the results of the mathematical modeling of Pascal's argument which is based on the danger to loose eternal salvation and suffering eternal hell.

The students initially thought that this argument should be logically convincing for Pascal's targeted audience (persons who doubt about God's existence but believe that if He exists then the teaching of the Church about Him is correct). Subsequently, they remarked that all those who consider Church's teaching to be true agree with Pascal's

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was writing the *Pensées* (e.g. see Adamson 1995; Mesnard 1951).

consideration that there is danger to loose eternal salvation and suffer eternal hell. However, they remarked, a considerable number of these persons, despite of this belief, make very little effort to live a virtuous life. So since the argument based on this danger does not convince many persons who believe that the danger is true, then the argument may also not convince doubting persons to whom Pascal is addressed.

Students continued discussing that, despite the fact that it seems rationally powerful the argument does not convince many persons who believe that the danger to loose eternal salvation is a true danger. Students proposed different explanatory elements; one of these that attracted the attention and the interest of many students is the following[12]: People find it very unpleasant and painful to think the eventuality that they will loose eternal salvation and will suffer eternal hell; thus they avoid to think about it and most of the time, or even all the time, they live their lives without thinking about this eventuality.

Other students remarked that this is not specific to the danger of suffering eternal hell and loosing eternal salvation; it is part of a more general behavior of people that concerns avoiding thoughts about extremely negative (either certain, or probable) future events. As an example, they mention that most people avoid and think rarely about their own death or the death of their (living) parents, which are certain future events, because such thoughts are very painful and hard. Other students mentioned other examples endorsing this consideration, such as avoiding thinking about future illnesses, accidents, professional catastrophes etc. However, some of them commented, that although existent indeed, such a behavior may become irrational when someone avoids to think on eventualities such as professional catastrophes, or some kinds of illnesses, or even suffering eternal hell; because these are cases about which, if he thinks, he can do things to minimize the risk of negative outcomes. Nevertheless, remarked one student, if someone thinks about suffering eternal hell not superficially, but intensively, and uses his imagination in order to catch even a small part of what he may suffer there, then such thoughts becomes quickly totally unbearable. Other students commented that if someone frequently, or - even worse - continuously, thinks about things such as loosing eternal salvation and suffering eternal hell, his future death, and so on, he may easily make his present life really miserable by his own thoughts alone; the aforementioned avoidance behaviors are in fact are important self-protection behaviors, they said[13].

[12] Other explanatory elements proposed by students' (such as that there are Christians who don't believe in eternal hell, or that there are peoples, like drogue addicted, who have no more the strength to be liberated from their passions) engendered limited discussion in the classroom at that time.

[13] Some of them also remarked that considerations of the kind "I live my life now, I repent later" may

Students thought that this avoidance and self-protection behaviors may very well be a strong explanatory factor concerning why Pascal's argument based on the danger of loosing eternal salvation and suffering eternal hell is less convincing than he thought; and that this explanatory factor concerns also the relevant version of the argument for those who believe that the teaching of the Church is true[14].

### 2.10 Modeling with time dependent utilities and expected utilities

Given students' remarks, the teacher proposed to consider the mathematical modeling of the wager for cases of doubting peoples that avoid thinking about the danger of loosing eternal salvation and suffering eternal hell. Two cases were examined, (a) the extreme and simpler case of a person that always avoids considering this danger, and (b) the case of a person, who does the same most of the time, but in rare occasions considers this danger.

For (a), students remarked that eternal hell and eternal salvation are constantly absent from the thoughts of this person and so the same holds for their utility; thus the utility of eternal hell and of eternal salvation should be put equal to zero (*U(EH)=0* and *U(ES)=0).*

Under this new assumption, and maintaining all the others assumption that hold for *Table1*, students formulated the expected utilities of wagering in favor ($E_1$) or against ($E_2$) God's existence:

$$E_1 = p_1 \cdot (U(ES) + U(PL_1)) + p_2 \cdot U(PL_2) = p_1 \cdot U(PL_1) + p_2 \cdot U(PL_2),$$

$$E_2 = p_1 \cdot (U(EH) + U(PL_3)) + p_2 \cdot U(PL_4) = p_1 \cdot U(PL_3) + p_2 \cdot U(PL_4).$$

The teacher underlined that in this case both $E_1$ end $E_2$ are finite; and that this constitutes an important difference from the original version of Pascal's wager, due to the zero utility value of eternal salvation and eternal damnation for this person.

He then remarked that whether $E_1$ is grater, or not, than $E_2$ depends on the involved person's considerations for $U(PL_1)$, $U(PL_2)$, $U(PL_3)$ and $U(PL_4)$.

He also noted that: If $U(PL_1)>U(PL_3)$ and $U(PL_2)>U(PL_4)$ then $E_1>E_2$, regardless of the magnitude of the probabilities $p_1$ and $p_2$; moreover, if $U(PL_1)<U(PL_3)$ and $U(PL_2)<U(PL_4)$ then $E_1<E_2$, again regardless of the magnitude of $p_1$ and $p_2$, (so in these cases *the*

facilitate the avoidance wished because of self-protection mechanisms. Others remarked that frequently suffering the thought of the threat of eternal hell in some persons may produce worst attitudes than avoidance; such as rejecting altogether Church and its teaching.

[14] It is interesting to note that these students' considerations are in line with well known pastoral considerations and concerns about the convincing power and the role of arguments based on the danger to loose eternal salvation and suffer eternal hell (e.g. see Bishop Kallistos Ware 1998, 6)

*argument from dominance* holds). However, in the other two cases whether $E_1$ is grater, or not, than $E_2$ depends also on the magnitude of $p_1$ and $p_2$.

For (b), students remarked that in this case two utilities values should be considered for eternal salvation; one applying to each moment that the person does not consider the danger of loosing eternal salvation and one for each moment that he does so (these values being 0, $+\infty$); they made the same considerations for eternal hell, with respective utilities values 0, $-\infty$. With these considerations students' informally composed a simple case of **time-dependent utility function**, which is an important concept in decision theory and economics, also studied in psychology (e.g. see Ferretti 2013, Trope & Liberman 2000).

With teacher's assistance they formalized the two utility functions as follows.

For, *ES*: obtaining eternal salvation, *EH*: suffering eternal hell,

$t_n$: the $n^{th}$ moment of the concerned person's life (a moment been a small period of time),

*C*: the set of moments of the person's life during which he considers the danger of loosing eternal salvation and suffering eternal hell,

$U(t_n, ES) = +\infty$ if $t_n \in C$ and $U(t_n, ES) = 0$ if $t_n \notin C$

$U(t_n, EH) = -\infty$ if $t_n \in C$ and $U(t_n, EH) = 0$ if $t_n \notin C$.

Subsequently, with teacher's help, students formalized the **time-dependent expected utility** of wagering in favor of God's existence for the concerned person, as follows.

Let $U(t_n, PL_1)$ be the finite utility value that the person considers for $PL_1$ at the $n^{th}$ moment of his life, and $U(t_n, PL_2)$, $U(t_n, PL_3)$, $U(t_n, PL_4)$ be defined similarly (for $PL_1$, $PL_2$ etc see *table1*) then

$E_1(t_n) = p_1 \cdot \left(U(t_n, ES) + U(t_n, PL_1)\right) + p_2 \cdot U(t_n, PL_2) = +\infty$ , if $t_n \in C$ , and,

$E_1(t_n) = p_1 \cdot U(t_n, PL_1) + p_2 \cdot U(t_n, PL_2)$ (some finite value), if $t_n \notin C$.

Similarly they formalized the **time-dependent expected utility** of wagering against God's existence for the person considered.

$E_2(t_n) = p_1 \cdot \left(U(t_n, EH) + U(t_n, PL_3)\right) + p_2 \cdot U(t_n, PL_4) = -\infty$ if $t_n \in C$ , and,

$E_2(t_n) = p_1 \cdot U(t_n, PL_3) + p_2 \cdot U(t_n, PL_4)$ (some finite value), if $t_n \notin C$ .[15]

Moreover, students asked if they could calculate for the considered person an average per moment utility value for some period of time consisting of several successive moments. The teacher explained that averaging over time utility values is a complex and

[15] Initially students expressed $E_1(t_n)$ and $E_2(t_n)$ considering that $p_1$ and $p_2$ are stable over time; later they realized a second formalization under the assumption that also $p_1$ and $p_2$ are time-dependent.

advanced issue, especially when infinite utility values are involved; and thus falls beyond an introductory course as the present one. However, along with students he calculated in the usual additive way the average utility value per moment for a period of several moments, in which only one moment belongs to *C*. The discussion on this and other similar examples offered students the occasion to realize that averaging in such a way produces an aggregate which is inadequate concerning the wager questions examined.

**Comment** At the end of the mathematical modeling activity for (b), students did not obtain the result sought[16]. However, during this modeling activity they encountered and worked with the important concepts of time-dependent utility and time-dependent expected utility, along with the particular case of such utilities having infinite values. Moreover, they struggled with the difficult and deeply rooted question of aggregation of such utilities. Thus, despite the final result this was an enriching modeling activity concerning students' scientific culture.

## 3 Desire that God exists: a motive for wagering in His favor

Subsequently, the teacher asked students if they thought that doubting persons that do not consider the danger of loosing eternal salvation might have substantial motives still for wagering about God's existence.

Students answered positively and initially mentioned as examples the real stories discussed previously (section 5.2.8), in which the motivation for wagering in favor of God's existence was the involved persons' wish and need to obtain God's help in difficult moments of their lives.

Furthermore, some students remarked that among those doubting about God's existence, there are persons who wish that God exists, because, for example, they prefer to live in a world governed by a loving and caring God; while others maybe do not prefer that God exists, because, for example, they don't want to live in a world governed by a God considered too restrictive and punishing. The first ones, they said, it is more probable to present wagering behaviors in favor of God's existence, e.g. pray to God,

[16] Students sought a mathematical modeling of the wager in the final outcome of which the weakening of the "loosing salvation" argument would be somehow reflected because of avoidance behaviors. They sought such a modeling under Pascal's assumption that the wagering decision is a unique – life-long- decision; and under this assumption they did not achieve to obtain the modeling sought.
It is worth noting that in their individual written essays, some students pushed the consideration of time-dependence further; they considered also time-dependent wagering decisions (instead of an unique – life-long - wagering decision). Thus they obtained a modeling in which it is indeed possible that the weakening of the "loosing salvation" argument be reflected. However, such a modeling was not discussed in the classroom.

hoping that He will help them to dissipate their doubts and to be convinced that He exists.

Other students commented that whether a doubting person desires that God exists or not is an important factor for wagering about God's existence; in fact, they said, such a desire may very well be a sufficient motive for wagering behaviors in favor of God's existence[17]. Moreover they proposed reasons because of which a doubting person may desire God to exist[18].

Some students remarked that if a doubting person decides to pray to God to help him dissipate his doubts and believe that He exists, this is indeed a wagering behavior in favor of God's existence; however it is far from the full wagering behavior proposed by Pascal. Other students observed that this remark is true, but only enhances previous discussion that wagering behaviors about God's existence should be considered as personalized behaviors; what Pascal proposes, they said, is a maximum wagering behavior which does not make the others invalid or unimportant. If God exists, they added, He might very well take into account, not only the practical efforts of the person, but also his desire to believe, and with His help such a wagering behavior may lead to the result that the person desires.

It is worth noting that the aforementioned students' considerations on the importance of doubting persons' desire and wish that God exists concerning wagering in favor of His existence are in line with some of William James considerations on the importance and the role of the *will to believe* (e.g. see James 1897, 1-31; Jordan 2006 ch 6) though our students were not familiar with William James' works.

## 4. Comment

In the first part of classroom discussion, the students acquired some familiarity with Pascal's wager and its mathematical modeling and discussed basic objections about the wager, at an initial level. During the modeling of Pascal's wager they had the opportunity to encounter and work with infinite expected utilities. Moreover they encountered, discussed and applied *the principle of maximum expected utility*.

Furthermore they realized some significant advances concerning the conceptualization of Pascal's wager.

They considered that wagering behaviors about God's existence should be regarded

[17] Some of them also added that, in some cases, this wish and desire may have more impact on convincing a doubting person to wager in favor of God's existence, than the threat of loosing eternal salvation and suffering eternal hell; wish sometimes produces negative reactions.

[18] E.g. because he desires that there is a God who cares for him and the other humans, that there is a benevolent purpose and design in the world and no to be in a purposeless world governed by randomness.

as behaviors adapted to the involved person's considerations and needs, concerning, both, the question that he faced and his efforts and contributions. In this context Pascal's wagering proposal was considered as a special case that initiate the discussion and as a point of reference for shaping alternative versions of the wager.

The development of classroom discussion and students' scientific culture led them to consider as an important request the request of empirical information concerning real doubting persons wagering behaviors about God's existence.

Students examining Pascal's argument which is based on the danger of loosing eternal salvation and suffering eternal hell, considered, on pragmatic grounds, that it has not the convincing power that Pascal thought. This, in turn, led them to question Pascal's utility function about eternal salvation and eternal hell, even for his targeted audience; and to consider a different such function that depends on time. Thus, they were led to a significantly different version of mathematical modeling of the wager. In these activities students had conceived and discussed simple cases of the important concept of time-dependent utility function (and of the subsequent time-dependent expected utility). This was another interesting benefit for students' scientific culture emerging from the classroom discussion on Pascal's wager.

Students considered that doubting persons' desire for God to exist and accordingly dissipate their doubts, is an important motive for wagering in favor of His existence; in fact, through these considerations, they considered the issue of *the will to believe* in the discussion of Pascal's wager.

## Second Part of Classroom Discussion

For preparing the second part of classroom discussion, in the 7th week of the course, the teacher proposed students to read an overview on the debate on Pascal's wager (Hájek 2012), and some other relevant works (in particular Hacking 1975; Jordan 1994; Lycan and Schlesinger1989)[19]. He encouraged them to feel free, after these initial reading to continue focusing on authors or lines of thought that they would find interesting and attractive in relation to their own ideas and thoughts. The students actively worked on this task as they found the subject attractive. So, from the 9th to the 11th week of the course[20] they orally presented in the classroom elements of their study and their own comments that substantially enriched the discussion there. Below we describe some characteristic aspects of this second part of classroom discussion:

[19] Moreover, given the development of previous classroom discussion, the teacher suggested that it would be also interesting to read on *The Will to Believe* of William James.
[20] Between the 8th and the 9th week of the course there was the two weeks Easter's holidays.

Students encountered in their readings, and presented in the classroom, a spectrum of hypotheses about God significantly larger than the one that they considered in the first part of classroom discussion. For some of these hypotheses they thought that they are only intellectual constructs elaborated for the sake of argument, or that it is improbable (or very rare) to be hypotheses having some significant weight in the considerations of real doubting persons; e.g. because they totally lacked the backup of tradition[21]. However they found others interesting, in particular hypotheses that suggest that there is not eternal hell; such as the hypothesis that all will be finally saved, or the hypothesis that after death the righteous are saved and the wicked pass to nothingness, not to eternal hell. For this last hypothesis they even formulated a corresponding version of the wager[22] and its mathematical modelling. For this version students considered the utility value of salvation to be $+\infty$ and the utility value of hell to be *0*.

Students also discussed Penelhum's (1971, 211-219) objection that the consideration of Pascal's wager that honest unbelievers will loose eternal salvation is an immoral consideration. This enriched and deepened previous relevant discussion in classroom (see section 5.1). Moreover, in relation to this discussion, the teacher with the students examined the mathematical modeling of a version of the wager with the additional assumption that virtuous doubting persons who don't wager in favor of God's existence do not loose eternal salvation.

Moreover, students presented Anthony Duff's (1986) objection that a doubting person who does not wager in favor of the of God's existence, still has some chance to convert before the end of his days. During the discussion on this objection, some students remarked that a person who in the present wagers in favor of God's existence and tries hard to live a virtuous life, still, he is not certain about eternal salvation because he may fall even at the end of his life, and conversely, a person who wagers against God's existence and lives a non-virtuous life, it is not certain that he will suffer eternal hell because he may repent even at the end of his life[23]. Other students endorsed these considerations and suggested that the modeling of the wager should allows some probability of suffering eternal hell for persons who in the present wager in favor of God's existence, and some probability of obtaining salvation for those who in the present wager against God's existence.

[21] E.g. the hypothesis of Martin (1983) that God rewards the unbelievers and punishes the believers, or the hypothesis of infinitely many possible Gods. It is worth noting that students arguments for restricting the spectrum of hypotheses to be considered find support in some of Lycan and Schlesinger considerations (see Lycan & Schlesinger 1989, Schlesinger 1994)

[22] This version concerns a person that doubts about God's existence and believes that if He exists then this hypothesis is true.

[23] These students' remarks echoed the well known Church's teaching that no-living person can be sure for his salvation after death.

A relevant version of the wager was modeled with teacher's help[24]. In this version, both the expected utilities of wagering in favor of God's existence and against God's existence were undetermined; so the application of the criterion of *maximum expected utility* was inconclusive. These results initially puzzled students. After further examination some of them considered that since the criterion of *maximum expected utility* was inconclusive then the doubting person should consider that the odds of eternal salvation are greater in the case of wagering in favor of God's existence and the converse holds for the odds of suffering eternal hell; and that this consideration points in the direction of wagering in favor of God's existence[25].

It is worth noting that with these comments students proposed to use a decision-making criterion of *maximum probability* similar to that proposed by Schlesinger (1994)[26].

Other students, based on grounds of intuitive rationality, thought that the difference of the Expected utility of wagering in favor of God's existence minus this one of wagering against God's existence is $+\infty$; and that this also points to the direction of wagering in favor of God's existence. However, other students objected that concluding that one undetermined value is better or greater than another undetermined value is meaningless, and thus the conclusion should be that this modelling leads to no definite conclusion. The discussion on this issue permitted students to understand that although there are criterions according to which this modeling leads to conclusion, these criterions are controversial.

After this discussion, the teacher discussed with students relevant paradoxes involving utilities and expected utilities of infinite value[27].

Concerning the utility value of hell and of salvation, some students presented a relevant consideration that they had read about; that, although salvation and hell may be infinite, humans may not be able to appreciate this infiniteness adequately because their perception and understanding are finite in several respects (Hájek, 2012). Many students endorsed this consideration and remarked that living humans are able to

[24] In this version, the utility values of eternal salvation and of suffering eternal hell were considered, once again, to be respectively $+\infty$ and $-\infty$. The conditional probabilities of eternal salvation and of suffering eternal hell, if God exists and the doubting person wagers in favor of God's existence, were named $p_s$, $p_h$ ; both $p_s$, $p_h$ were considered to be different than *0* and $p_s + p_h$ was considered to be equal 1. The respective conditional probabilities if God exists and the doubting person wagers against God's existence were named $p_s'$, $p_h'$; both $p_s'$, $p_h'$ were considered to be different than *0* and $p_s' + p_h'$ was considered to be equal 1.
It was also considered that $p_s > p_s'$ and consequently $p_h < p_h'$.

[25] In their argumentation, they considered that utilities and expected utilities of earthly lives could be disregarded in this modelling because of being too small, compared to the infinite utilities and expected utilities of salvation and hell.

[26] Which, however, is not uncontroversial (e.g. see Bartha 2007; Sorensen 1994).

[27] Some of them concerned the wager, while others do not; the teacher also suggests further relevant reading (e.g see Bartha 2007; Jordan 2006 ch4; Sorensen 1994).

perceive eternal salvation and suffering eternal hell only at an abstract level, and not at the level of feelings and sensations. Some of them stretched that what Pascal proposes for salvation *(an infinity of infinitely happy life)* can not be perceived because man has neither the experience of happiness of infinite intensity nor the ability for this feeling; and that the same holds for feelings of suffering of infinite intensity. However other students remarked that, although these considerations are sensible, previous modeling involving infinite utility for eternal salvation and hell should not be considered as invalid because of these; since humans can still conceive such utilities, even though at an abstract level only. They thought that such modeling should be available to people that consider it adequate for themselves; e.g. persons who consider that argumentation of this kind is very important to them; Pascal, they added, should be one of them.

After these considerations, students with teacher's help formulated a relevant version of the wager and its mathematical modelling; in this version they considered the utility values of salvation and of suffering hell to be finite. Students observed that in this version of the wager the application of the criterion of *maximum expected utility* is possible to suggest not to wager in favor of the hypothesis of God's existence, and that this depends on the considered utility and probability values; they thought this to be another important difference from previously examined versions of the wager. Some of them considered that in this version of the wager the utility values are closer to the reality of limitations of human understanding and because of this the possible outcomes of the criterion include the alternative result (not wager in favor of God's existence); which however, they remarked, is also a real behavior observed among doubting persons.

Another interesting issue is the classroom discussion on William Clifford's (1877) and William James's (1897, 1-31) considerations.

Some students presented William Clifford's considerations; that believing in hypotheses supported by insufficient evidence makes a person credulous and opens the door to superstitions; and this contributes to humanity becoming so.

They also contrasted these considerations with William James's considerations that there are cases where evidences are possible to be obtained only after, and because of, believing in some hypothesis and that if the hypothesis is of vital interest for a person, then he has the right to believe it despite insufficient evidence. This presentation engendered a vivid and lengthy discussion among students. In the discussion students, following Clifford's and James's considerations, considered and compared not only the case of belief about God's existence, but also examples concerning the role of faith in human relations (marriage, friendship) and examples concerning the acceptance of

scientific hypotheses. In this context, the teacher mentioned as relevant the concept of working hypotheses in science; he also mentioned that there were cases of hypotheses for which many scientists worked for a long time having the conviction that the hypothesis is true, and hopping that the results of their work would contribute to its proof (verification) (such as Euclid's 5th postulate and the molecular hypothesis).

Students thought that both Clifford's and James's considerations have valid and important arguments. However, they considered that in issues of vital importance for the doubting person, such as whether God's exists or not, the person has the right at least to wager in favor of a hypothesis hopping that the activities he will realize under this admission will finally help him to dissipate his doubts.

## Third Part of Classroom Discussion

During the 7th week of the course the teacher realized two meetings with the eight students willing to do some limited empirical investigation work on doubting persons' behaviors concerning wagering about God's existence; namely, to try to collect real stories by interviewing relatives and friends who may have relevant experiences. In these meetings he provided students guidance concerning the realization of the interviews; it was also specified that the interest was on persons that possibly had themselves such a wagering behavior; so, persons knowing stories for somebody else were not what we sought.[28]

Students collected 25 stories; 16 of them concerned doubting persons and contained elements of wagering behaviors about God's existence. The teacher with the eight students selected seven stories to be presented in the classroom, which had a sufficient variety for stimulating the discussion there (see Appendix). Five out of the seven stories concern at least two distinct periods of the involved doubting person (e.g. one period during which he does not wager in favor of God's existence and one period during which he does). The two other stories concern one long period and a long term behavior/attitude (one of them is difficult to classify, the other concern a believer wagering against the existence of eternal hell).

These stories were presented in the classroom by the interviewing students and provoked the interest of their colleagues and a rich classroom discussion[29]. Below we present main points of students' considerations and comments during this discussion.
Students considered that these stories, and the two stories told in the first part, point

[28] Moreover, the first interviews collected were discussed in similar meetings for identifying difficulties and flows; in order to ameliorate the realization of the subsequent interviews.
[29] Many students, being interested on the subject, asked their interviewing colleagues to inform them on the other stories as well; those collected but not told in the classroom.

out that there are wagering behaviors of real doubting persons about God's existence. However, they observed that the wagering behaviors in these stories differ substantially among them and from Pascal's wagering proposal concerning motivations, duration and means. They considered that these stories support their previous considerations that real doubting persons' wagering behaviors about God's existence are personalized and adapted to their considerations and needs.

Many students considered that doubting persons, who wager explicitly and consciously against the hypothesis of God's existence (e.g. story 4) should be distinguished from those who do not wager in favor of God's existence because of recklessness and/or indifference to the question of God's existence (e.g. story 6). However, there were also students who argued supporting Pascal's classification in two categories only (wagering in favor of God's existence, not wagering in favor…).

Students remarked that in the five stories[30] that concerned doubting persons in difficult situation who wager in favor of God's existence for obtaining His help, their wagering behavior along with the development of the events (illnesses, professional problem) influence their considerations about God. However, they observed, this influence may not be permanent (see in annex story no5).

For these five stories they also remarked that the involved persons pried to God and Saints of the Church and not to some generic God. The teacher observed that it was so also in the other stories of this kind that were collected but not reported in the classroom; however, he stressed that these few stories only point out that such behaviors exist among real persons, and do not support conclusions about non-observed behaviors. Some students hypothesized that doubting persons about God's existence, who in difficult situations of their lives wager in favor of His existence and pray for His help, probably pray to God according to a conception of Him which is familiar to them, because of cultural environment, tradition and/or education, and do not pray to some generic, anonymous God. Other students considered that this could be a frequent case in societies with strong religious tradition, but, they stressed, such hypotheses need systematic empirical research to be verified.

Students were very interested in stories (6) and (7) where the doubting persons do not wager in favor of God's existence but still, they change and believe in His existence. They considered that these stories support Duff's, and their own, considerations that it is possible not to wager in favor of God's existence and, still, to be converted and become a believer.

Some of them observed that events happened that these persons considered as

[30] Counting also the two stories presented in the first part of classroom discussion.

evidence of God's existence; these may or may not be objective evidences, they remarked, but these persons received what they needed to believe.

Concerning story 9, some students considered that in this story there are elements of a long term wagering behaviour in favour of God's existence. Others added that the involved person's considerations are connected with the *argument from dominance*; since she considered that, if God's exists, what He wants to do in her life is good and attractive to her. However some students thought that in this case there aren't elements of wagering in favor of God's existence; since there is not a substantial shift in her behaviour because of her considerations about God's existence, and her considerations about Him work only as an additional motive for enhancing what she would have done anyway.

Story 8 engendered discussion on the existence of wagering behaviors not about God's existence but about God's characteristics. Based on their first and second hand experiences, many students thought that this could be a frequent phenomenon. Some of them argued that such behaviors may be influential in shaping involved persons' beliefs about God.

Students agreed that, besides its philosophical interest, Pascal's wager was a pioneering work, which at an early time pointed to an important human behaviour; namely, that of wagering about God's existence. Some of them commented that at the empirical level, wagering behaviours about God's existence are insufficiently examined even nowadays[31].

## Final Comments

**1.** The classroom discussion and the related students' individual work realized during this course allow them to obtain some significant insights in Pascal's thought about the wager concerning God's existence, as well as, on the relevant debate among philosophers and decision theorists[32].

Moreover they realized some significant conceptual advances concerning this subject.

- They reconsidered Pascal's wager in a dynamic way; more precisely they considered that wagering about God's existence should be considered as adaptable to the involved person's considerations and needs, concerning both the question he faced and his efforts

[31] These students had searched in psychology for empirical works concerning wagering behaviours about God's existence, but they do not achieve to find such works. Considering the subject as an important one they thought to be insufficiently examined at the empirical level.

[32] However, given the extent and the importance of this debate, the work done in this course has to be considered only as a first-initiation work on Pascal's wager.

and contributions. In this context, the initial version of the wager was regarded as a special case that initiated the subject and as a reference point for shaping alternative versions of the wager.

- The classroom discussion and students' scientific culture led them to consider as important the request of empirical information concerning real doubting persons' wagering behaviors about God's existence. Their interest on this issue led them to collect, with teacher's assistance, some real stories concerning such wagering behaviors. Students thought that these stories supported their previous considerations; that wagering behaviors about God's existence are, and should be considered as personalized behaviors. The discussion on this material fed the debate further.

- Students considered, on pragmatic grounds, that Pascal's argument based on the danger of loss of eternal salvation has less convincing power that Pascal thought. However, they considered that doubting persons' desire that God exists is an important motive for wagering in favor of His existence; through these considerations, they introduced the issue of *the will to believe* in the discussion of Pascal's wager.

Further discussion on the subject, in connection with William Clifford's and William James's considerations, led them to consider the question of legitimacy of beliefs and convictions supported by insufficient evidences.

- In connection with the aforementioned, students worked on the modeling of different versions of the wager. This permitted them to work with the concepts of infinite utility and of infinite expected utility; concepts with which they had very little familiarity until then; as well as, to face some interesting problem of decision theory in situations that such utilities are involved.

## 2. Students' familiarity with Orthodox tradition and the discussion on Pascal's wager

All along the classroom discussion, in students' comments and considerations their familiarity with Orthodox tradition was frequently observed, as well as, the important influences they have received from this tradition.

Students' relation to Orthodox tradition both restricted and deepened important aspects of the discussion on Pascal's wager. This is particularly true concerning (i) the many God's objection on Pascal's wager, and (ii) students' considerations and comments about doubting persons' considerations concerning God's existence.

Their relation to Orthodox tradition was a factor that works in the direction of restricting the spectrum of hypotheses about God that they considered interesting to examine as hypotheses of persons doubting about God's existence. A number of such

hypotheses, regarded by philosophers and decision theorists, were considered by the students as uninteresting to be examined, because they lacked the backup of tradition and they thought of them as improbable (or very rare) to be hypotheses having some significant weight in the considerations of real doubting persons. On the other hand, their relation to this tradition was a factor that enriched and deepened their thoughts on the hypotheses that they examined.

Moreover, students' relation to Orthodox tradition enriched the insightfulness of their thinking concerning doubting persons' considerations about God's existence. In turn, it was this insightfulness that led them to overcome limitations in the discussion imposed by the presence of Pascal's threat argument of losing eternal salvation, and to consider doubting persons' desire that God exists as an important motive for wagering in favor of His existence.

### 3. Mathematical modeling in the discussion on Pascal's wager

In the class work on Pascal's wager, elements of probability and decision theory were systematically involved. Besides (subjective) probabilities, utilities and expected utilities, often of infinite value, were involved as well as criterions of decision-making.

These elements were structured in modelling activities of versions of Pascal's wager and led to interesting problems of decision theory. The mathematical elaboration on infinite values already presented some difficulty for students; but more importantly, often the results of mathematical elaboration were questionable or even in contrast with respect to intuitive rationality. Such tensions enhanced or led to question the initial premises of the modeling; for example, to question of the adequacy of the attribution of infinite values to involved utilities and expected utilities; however, replacing these infinite values with finite ones presented other fundamental inadequacies. Thus, in these modeling activities students encountered and worked with the concepts of utilities and expected utilities of infinite value, and faced some related deeply routed questions in probability theory and decision theory, along with a network of relevant problems.

In these modelling activities, students observed that correct mathematical elaboration does not always lead to safe and/or uncontestable results; as it is, for example, the case in Euclidean Geometry, where the initial premises (axioms) are not questioned[33]. On the other hand, the clarity of mathematical elaborations that led to question initial premises of the modelling permitted to identify flaws of these premises

[33] Students, although they had heard about the existences of non-Euclidean Geometries, they had never worked with some Geometry incompatible with the Euclidean. Moreover, students had very little, if any, experience of mathematical modelling work that may leads to unsafe or contestable results for other reasons than the well known "you haven't do your work correctly".

that it was very difficult, or not possible, to identify as long as these premises were discussed at the literal level.

Thus, these modelling activities permitted students to appreciate that mathematics may have an important role in the discussion of philosophical issues, to understand some basic aspects of modelling work and even to question stereotypes and enrich their concept image for mathematics.

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## Appendix: Stories collected and told in the classroom concerning wagering behaviors about God's existence.

In what follows, we present brief summaries of the nine real stories that were told in the classroom by students.

The first two stories were told during the first part of the classroom discussion. The students knew these stories because the involved persons were their relatives[35].

The other seven stories were told in the classroom during the third part of the classroom discussion by students that collected them by interviewing the involved persons. (The stories were told in the classroom in the order of their present enumeration.)

### Summaries of stories told in the first part of classroom discussion

(1) The involved person in this story had strong doubts about God's existence and no religious practice. In a period of his life he faced the problem of a serious illness of a close relative. He wagered on God's existence in the sense that despite his doubts in this period he often prayed to God and to a Saint (of Orthodox Church), went to Church and even made an oblation. The illness problem he faced had a positive outcome. After the wagering period he believed that very probably God exists; and still he conserves the same idea. So his doubts were not completely dissipated but his probabilistic modeling about God's existence changed.

(2) The second story has similarities to the previous one, but differs concerning the change of the doubting person's beliefs after the wagering period: He considered that the positive outcome of his illness problem was clearly the result of God's help and His

[35] During the period of interviews' collection students interviewed the two involved persons and gathered additional information on these stories; however, as the enriched versions of the stories were consistent with those initially told in the classroom the two stories were not told again in the third part of classroom discussion, for time saving.

response to his priers. So he considered this outcome as proof of God's existence, thus his doubts was dissipated.

**Summaries of stories told in the third part of classroom discussion**

(3) This story has close similarities to the second one; the involved person, according to what he said in the interview, had important doubts about God's existence and no religious practice. In a period of his life he faced the problem of a serious illness of a close relative. He wagered on God's existence in the sense that despite his doubts in this period he often prayed to God and to Mother of God and went to the (Orthodox) Church. The illness problem he faced had a positive outcome. After this wagering period he believed that God exists. According to his account, what he mainly convinced him was not the healing itself, but the strong filling that during the illness period "Someone" providing him internally with hope and courage despite all odds and doctors pessimistic opinions.

(4) The involved person in this story had doubts about God's existence and no religious practice. In a period of his life he faced a serious professional problem. He wagered on God's existence in the sense that despite his doubts in this period he prayed to God and to (Orthodox) Saints and often went to the Church. The professional problem he faced had a negative outcome. After this wagering period his doubts were substantially strengthened, and decided to live as if God does not exist. He expressed three considerations to explain his attitude: (i) the professional outcome he suffered was totally unjust; if God existed and was benevolent he shouldn't suffer this, but he did, so very likely God does not exist, (ii) if God exists then He was indifferent about him, so it is only fair that he is indifferent about God, and (iii) if God exists and He wants that he believes in Him then it is up to Him to prove him His existence, and to explain this injustice.

(5) This story has similarities to the first one. The involved person had important doubts about God's existence. In a period of her life, she faced a problem of serious illness. She wagered on God's existence in the sense that despite her doubts in this period she often and warmly prayed to God (Christ). She finally overcame her illness problem. After the wagering period she believed that very probably God exists; so her doubts were not completely dissipated but her probabilistic modeling about God's existence changed. However, gradually her doubts were strengthened and she comes about to the same ideas and doubts that she had before the wagering period.

(6) The involved person in this story had doubts about God's existence; he had no religious practice and he was indifferent to what Church says. According to his own

account, in fact he was indifferent to the question of God's existence and paid little attention to his own doubts. Then, he had a motorcycle accident in which according to the police he should have been killed, still, he survived it intact. Shortly after this he realized that the accident happened near by the yard of the (Orthodox) church of St… He considered his rescue as miracle due to the Saint; his doubts were dissipated and he firmly believed in God's existence.

(7) The involved person had strong doubts about God's existence mainly due to the fact that she lived a difficult life and she considered that this was unjust and incompatible with a just and benevolent God. She lived paying no attention to the Church and to what she then thought to be hypothetical God's wants. One day she had a serious car accident; during the accident she felt a presence that protected her from abruptly colliding to the ground. She considered this as a miracle. Because of this consideration her doubts was dissipated and she believed in God's (Christ) existence.

(8) The involved person believed in God, and was familiar with Pascal's wager; however he had strong doubts about the existence of eternal hell. According to his account, he decided to put aside his doubts and live with the admission that eternal hell does not exist. He expressed four considerations to explain his attitude: (i) he thought eternal hell to be totally incompatible with God's love and benevolence, (ii) he found equally unsatisfactory the free-will justification of eternal hell offered by the Church, (ii) thinking that anybody is in eternal hell grieved him and obstructed him from loving God, (iv) he thought that, even if he is wrong, it is better to have a wrong idea than to be unable to love God. However, he admitted that on rare occasions the question still concerned him.

(9) The involved person had important doubts about God's existence; however she had intense charity activity. According to her account, people's hard problems and poverty grieved her, while helping them made her feel better for them and for herself; also, she considered helping others as a moral duty. She said that her thought that God may exists was an additional motive for enhancing charity activity, because she thought that if He exists then her activity should satisfy His requests.

# 3. WESTERN CHRISTIANITY

# AUGUSTINE ON "WHY THE WORLD IS AS LARGE AS IT PRECISELY IS" (EP.3,2)

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## The issue of the size of the universe

From the outset of his letter, Augustine astonishingly complains that his ignorance of some problems of physics prevents him from being happy: "But now, how am I happy or what sort of a happy man am I, who do not know the reason why the world is as large as it precisely is, while the proportions of the shapes through which it extends do not in any way prevent its being larger to the extent anyone might wish."[1] Indeed, could not the world be larger or even grow *ad infinitum*, while keeping the same proportions between its components?

The hypothesis of a world which endlessly increases is substantiated by the fact that there is no body (at least in Augustine's physics, which is Aristotelian) whose size cannot decrease indefinitely because of the infinite divisibility of all bodies. According to the *De immortalitate animae*, the body "can decrease to infinity by being cut to infinity" (*potest igitur infinite caedendo infinite minui*), as evidenced by the process of dichotomy endlessly applied; for "if one takes for instance half <of a body>, and still half of what remains, the magnitude decreases and tends towards its end, without being able to reach it in any way" (*De immort. anim*. 7, 12; see as well *De lib. arb*. II, 8, 22). In our letter, however, this idea is not so clearly expressed: we must "admit", says Augustine, "that the body divides to infinity, producing, from what I would call a determinate basis, which extends to a determinate quantity, a determinate number of corpuscles."[2]

[1] "Nunc uero quomodo uel qualiscumque beatus sum qui nescio, cur tantus mundus sit, cum rationes figurarum per quas est nihil prohibeant esse quanto quis uoluerit ampliorem?" (*Ep*. 3, 2).
[2] "Aut non mihi diceretur, immo non cogeremur confiteri corpora in infinitum secari, ut a certa uelut basi in quantitatem certam certus corpusculorum numerus surgeret?" (*Ep*. 3, 2).

So, if it is true that there is no minimum body because of the infinite divisibility of bodies, why should there be a maximum body, that is to say a body than which no larger one can exist ? Why should the size of the universe be limited?

## A problematic hypothesis

It is important to note at once that Augustine's hypothesis of a homothetic increase of the world is problematic, although Augustine says nothing about this issue in his letter. One can indeed ask: if something is large only *in relation to something else*, and not *in itself*, what allows us to say that the world grows when absolutely everything grows in the same proportions?

As a matter of fact, on the ground of such a principle, Augustine himself seems to have denied in a passage of the *De musica* (which is a little bit later[3]) the consistency of the very hypothesis which he formulates in our letter. The text reads as follow: "This world, which contains everything, is large (*magnus est*) (...) and if all its parts reduce proportionally, it is still as large (*tantus est*) and if they increase proportionally, once again it is still as large (*tantus est*), for as regards spaces or spaces of time, nothing is large by itself but it is smaller in relation to something else"[4]. Is there not a contradiction between *De musica* and *Letter* 3?

Pierre Hadot, who had a clear grasp of the difficulty, claims, in an outstanding article devoted to our letter, that "in the text of the *De musica*, *tantus* means the apparent size of the world"[5]. So it must be understood that in the case of a homothetic increase, the *apparent* size of the world has not changed (it keeps *in our eyes* the size it already had) but its *absolute* size has indeed changed, even if we did not notice anything since we grew ourselves along with the world.

However, does this distinction between the apparent size of the world and the absolute one makes Augustine's hypothesis satisfactory? A problem still arises, since Augustine does not say what is the invariant which allows, in his assumption, to conceive that the *absolute* size of the world has increased. Since everything increases, Augustine even seems to consider that there is no invariant at all. But he does not seem to consider that the fact that there is no invariant renders the very hypothesis of a homothetic growth of the world *meaningless*.

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[3] Book 6 of *De musica* was completed in the end of 388, after Augustine's return to Africa.

[4] "Sic habendo omnia magnus est hic mundus (...), cuius omnes partes si proportione minuantur, tantus est; et si proportione augeantur, nihilominus tantus est: quia nihil in spatiis locorum et temporum per seipsum magnum est, sed ad aliquid breuius" (*De mus.* VI, 7, 19).

[5] "'Numerus intelligibilis infinite crescit', Augustin, *Epistula* 3, 2", in *Miscellanea André Combes*, Vol. I, Rome, 1967, 181-191 (here, 183). See as well P. Hadot, "La notion d'infini chez saint Augustin", *Philosophie*, 26, 1990, 59-72, which furthers the previous paper.

At this stage, if we want to continue our investigation of the issue at stake, we may add some precisions, which allow us to link to some extent Augustine's issue with the physics of our time: the difficulty I have pointed out is not a problem *for us*, because we know well that, according to Einstein's Relativity, there is indeed in the universe such an invariant as the one we are looking for, namely the speed of light in a vacuum, whatever the landmark.

Moreover, we know that astronomers were able to prove, thanks to the invariance of this speed, that our universe is expanding. Indeed, according to the laws of classical and modern physics, spectral analysis of light provides information on the motion of the source in relation to the spectrograph since this movement shifts the wavelengths. Hubble has observed a spectral shift of the light of the galaxies towards the red (the famous "red-shift"), as if the galaxies were all moved by a universal movement of flight, all the more quickly as they are more remote.

Now, if we come back to Augustine's problem, *assuming that for him some invariant can exist*, whatever it may be, then in his hypothesis, we note three main differences between the growth of "his" universe and the expansion of our own.

## Augustine's growing world and the expanding universe

Firstly, for Augustine, the growth of the world is a mere *possibility*, not a fact: he makes the hypothesis of a homothetic increase, which is *a priori* possible, in order to show that the *fact* that the world is as large as it actually is, and not smaller nor larger, is difficult to explain —and we shall see in the end, that according to Augustine, the possibility of a change in the size of the world still remains open from a theoretical point of view.

The second difference is that, in the expansion of our universe, it is the space underlying the objects that expands, not the size of the objects themselves. As I have said, Hubble has observed a spectral shift of the light of the galaxies towards the red, *as if* the galaxies were all moved by a universal movement of flight, all the more quickly as they are more remote. Now, in order to avoid a paradox —the one which would lead us to grant most distant objects a speed faster than the speed of light—, Hubble's measure is explained by the claim that the universe is expanding. Thus, the objects do not move themselves because of the expansion, it is the underlying space that expands, carrying objects which remain "fixed" in relation to it and which keep *the same seize*. If we imagine some points plotted on a balloon membrane which is being stretched, we have a pretty good picture of the phenomenon at stake.

The third difference consists in the fact that presently physicists still do not know for sure whether our expanding universe is finite or infinite, while Augustine's world is a

*spherical and finite* growing universe (like Aristotle's one), which makes him wonder if its growth could go on *ad infinitum* —and Augustine will precisely intend to show that the world is necessarily finite because its potential growth is necessarily bounded.
Let's now see how Augustine deals with his problem, that is, that nothing seems *a priori* to prevent the world from increasing *ad infinitum*.

## The doctrine of the two numbers

To solve this problem, Augustine appeals to a doctrine which, according to his owns terms, he has already revealed to their common friend Alypius "in complete secrecy" (*occultissime*) —which probably means: without teaching it to his young students Licentius and Trygetius, who were not advanced enough to get benefit from it[6]. This doctrine is based on the opposition between two kinds of numbers: "Since the intelligible number increases to infinity, but does not decrease to infinity—for it is not possible to break it down past the monad <*i.e*. the unit>—, on the other hand the sensible number —for what else is the sensible number, but the quantity of bodily things or of bodies? — can decrease to infinity, indeed, but cannot increase to infinity."[7]

The problem here considered and the response it receives stands within a precise philosophical tradition: "Against the infinite worlds of the Presocratics, Aristotle had conceived a theory of the sensible infinite which is exactly the one we find in Augustine. There is infinite only in the division, more exactly in the possibility of going on still further in the division, but there is no infinite by increase in the sensible world (cf. *Phys*. 206a14-17, 206b18-25, 204b5)."[8]

Aristotle demonstrates in Book III of *Physics* (III, 5, 204b1-206a8) that a body of infinite size cannot exist for some reasons related to his theory of so-called "natural places". In short, the hypothesis of a natural place is consistent only in a finite universe since an infinite space can have neither centre nor ends towards which bodies might go naturally (by falling or rising)[9].

Augustine's explanation about the need to limit the size of the world is quite different: it provides no *physical* justification, as Aristotle did; it rather consists in a speculative inference, which involves the fundamental opposition between the sensible

[6] *Letter* 1 to Hermogenianus admits the legitimacy of an *ars occultandi*.
[7] "… quoniam numerus ille intellegibilis infinite crescit, non tamen infinite minuitur – nam non eum licet ultra monadem resoluere –, contra sensibilis – nam quid est aliud sensibilis numerus nisi corporeorum uel corporum quantitas ? – minui quidem infinite, sed infinite crescere nequeat" (*Ep*. 3.2). On Augustine's interest in numbers, see C. Horn, "Augustins Philosophie der Zahlen", *Revue des Études Augustiniennes*, 40, 1994, 389-415.
[8] Hadot 1967, 184.
[9] On this issue, see for instance R. J. Hankinson, "Science", in J. Barnes (ed.), *The Cambridge Companion to Aristotle*, Cambridge, University Press, 1995, 140- 167 ; esp. 140-144 ("Finitude, Motion, and Natural Place").

and the intelligible natures[10]. Augustine claims that the fact that the sensible and the intelligible have contrary properties explains *perhaps* the limit which he bestows on the world[11] : if the *intelligible* number —that is the cardinal one— can only grow to infinity from the unit (like 1, 2, 3, etc.) but cannot decrease past it, and if the intelligible and the sensible natures have contrary properties, then the *sensible* number —that is the size of a body, which can the world itself— can decrease to infinity by division (like 1, 1/2, 1/4, etc.), but it cannot increase to infinity.

Is Augustine himself the author of the opposition between these two numbers on which he lays the foundations of his reasoning? It is important to point out that, despite the distance that separates the ways both authors prove the finitude of the word, Augustine's opposition between the two numbers depends basically on the one Aristotle drew between "the infinite by division" (*kata diairesin*) of the *magnitude* (i.e. the magnitude or size of corporeal things), on the one hand, and "the infinite by addition" (*kata prosthesin*) of the *number*, on the other hand. Here, we must quickly remember a few points of Aristotle's theory of the infinite.

## "Infinite by division" and "infinite by addition" according to Aristotle

As it is well known, "Aristotle is, in a variety of senses, a finitist. He rejects the idea that there can be actualized infinite sets of things."[12] I have already recalled that Aristotle shows, on the basis of his theory of "natural places", that there is no infinite body and that the world is necessarily finite. Yet, straight after his demonstration, he adds: "to suppose that the infinite does not exist in any ways leads obviously to many impossible consequences" (*Phys*. III, 6, 206a9-10). For instance (I set aside the one related to time), the magnitude will not be divisible into magnitude (that is to say: it will not be divisible into magnitude which is in turn divisible into magnitude, and so on). Secondly, the number will not be infinite, whereas we can count *ad infinitum*.

Aristotle's solution depends on the claim that both the infinite by division of the magnitude and the infinite by addition of the number have only a *potential* existence. Thus, the possibility for a magnitude to be divided to infinity is not likely to be ever fully actualized, unlike the possibility for the bronze to become a statue. No spatial magnitude can ever be actually divided into an infinite number of parts.

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[10] *Letter* 5 is mainly devoted to this opposition.
[11] In the end of his explanation, Augustine carefully states: "perhaps the answer <to the problem> may be found in the contrary property of the intelligible number" ("fortasse responsum est de ui contraria intellegibilis numeri") (*Ep*. 3, 2).
[12] Hankinson 1995, 140.

What is the relationship between these two infinites? In fact, Aristotle says that "in a way, the infinite by addition is the same thing as the infinite by division" (206b3-4), while being generated in a opposite way (*antestrammenôs*), "for just as we see division going on *ad infinitum*, so we see addition being made in the same proportion" (206b5-6). The idea is simple: by applying the dichotomy process *ad infinitum* to a given magnitude, one increases *ad infinitum* the number of the smaller and smaller parts whose sum tends toward the whole (e.g. 1/2 + 1/4 + 1/8, etc., tend toward 1). From the (potential) infinite divisibility of the magnitude stems the infinity of the number.

Finally, Aristotle states that, while being both potentially infinite, number and corporeal magnitude have opposite properties: "It is reasonable too that while in number there is a limit in the direction of the minimum, but in the direction of 'more' number always exceeds any multitude, in the case of magnitudes, on the contrary, they exceed any magnitude in the direction of 'less', but in the direction of 'more' there is no infinite magnitude. The reason is that what is one is indivisible whatever may be one (e.g. a man is one man, not many), but number is a plurality of 'ones' and a certain quantity of them. Hence number must stop at the indivisible."[13] In a nutshell, this passage states that number has a minimum but no maximum, whereas magnitude has a maximum but no minimum. Moreover, it accounts for the claim that number cannot decrease past the unit —for we can have for instance two men, or one man, but not half of a man—, which precisely plays the role of a premise in Augustine's key inference.

If we come back to *Letter* 3, we see that Augustine takes up Aristotle's opposition while introducing two differences. First, Augustine does not hesitate to give the name of "number" to "the quantity of what is corporeal" (*corporeorum uel corporum quantitas*), that is to say, to the Aristotelian magnitude. This attribution seems to be a novelty since for Aristotle, the number is discrete and not continuous like the magnitude. Aristotle's numbers are what we call "natural numbers" while in Augustine's thought, they become continuous, as the bodies themselves.

The second difference is obviously the fact that Augustine speaks of an intelligible number in a Platonic sense (as the subsequent text makes it even more explicit). So, we find in our letter the transposition of an Aristotelian opposition within a framework which is Platonic[14].

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[13] "εὐλόγως δὲ καὶ τὸ ἐν μὲν τῷ ἀριθμῷ εἶναι ἐπὶ μὲν τὸ ἐλάχιστον πέρας ἐπὶ δὲ τὸ πλεῖον ἀεὶ παντὸς ὑπερβάλλειν πλήθους, ἐπὶ δὲ τῶν μεγεθῶν τοὐναντίον ἐπὶ μὲν τὸ ἔλαττον παντὸς ὑπερβάλλειν μεγέθους ἐπὶ δὲ τὸ μεῖζον μὴ εἶναι μέγεθος ἄπειρον. αἴτιον δ' ὅτι τὸ ἕν ἐστιν ἀδιαίρετον, ὅ τι περ ἂν ἓν ᾖ (οἷον ἄνθρωπος εἷς ἄνθρωπος καὶ οὐ πολλοί), ὁ δ' ἀριθμός ἐστιν ἕνα πλείω καὶ πόσ' ἄττα, ὥστ' ἀνάγκη στῆναι ἐπὶ τὸ ἀδιαίρετον" (*Phys*. III, 7, 207b1-8).

[14] Is Augustine the author of this transposition? In view of the proximity of the texts, Augustine certainly relies on a author who knew the passage of *Physics* III which contrasts magnitude and number. The most likely source seems to be Porphyry's commentary on Aristotle's *Physics* (opus no. 14 on Beutler's list in

## Conclusion

Armed with such a doctrine, Augustine can eventually provide a *partial* answer to the question he raised about the size of the universe: it turns out that the sensible world is necessarily bounded and thus an infinite corporeal magnitude is just a product of our imagination. It is imagination that gives birth to Epicurus' countless worlds[15], and perhaps also to "the eternal silence of these infinite spaces" that "frightened" Pascal (*Pensées*, 206 Brunschvicg = 201 Lafuma). In any case, we still do not know why the world has the size it actually has, since it could be larger or smaller … Thereupon, Augustine completes nicely his analysis saying "*nunc dormiendum*" (it is time to sleep …)[16].

To conclude, fortunately, in our case, we can get rid of Augustine's puzzlements. Since Galileo's *Discorsi* on (1638), we have been knowing that physics is *not invariant* in case of changes of scale: if the length of an object grows, its volume, and thus its mass, grows more quickly, as the cube of the length. Now volumes, masses, and lengths do not have the same role in the behaviour of physical objects. For example, in the case of suspension bridges, there is an intrinsic limit in their size because, when we increase their size, the weight of cables grows more quickly that their internal resistance. The latter grows as the surface, the former as the volume. Thus, we reach an inevitable breaking point when the weight prevails over the internal resistance[17]. A world which would increase like the one Augustine imagines would eventually collapse, so to speak.

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"Porphyrios", Pauly-Wissowa, *Realencyclopädie der classischen Altertumswissenschaft*, 1978, t. 22, 1, 275-313). However, did Augustine find in his source the Aristotelian opposition between the properties of number and the ones of magnitude or did he already find the opposition between a *sensible number* and an intelligible one, formulated in Platonic terms ? One can hardly answer such a question.

[15] See *De vera relig.* 46, 96; *Contra ep. fund.* 18. On this topic, see Hadot 1990, 64-65.

[16] However, that night Augustine did not intend to sleep, for he immediately moves on to a demonstration of the immortality of the soul which he has just developed in the *Soliloquies*. On this proof, see E. Bermon, "Augustins Argumentation für die Unsterblichkeit der Seele in den *Soliloquia*, in der *Epistula* 3 und in *De immortalitate animae* 5-6", in Augustinus, *De immortalitate animae - Über die Unsterblichkeit der Seele*. Herausgegeben, übersetzt und kommentiert von Christian Tornau, Paderborn, Schöningh (forthcoming).

[17] On this law and its application to living things, see S. J. Gould, *Ever Since Darwin*, New York, W. W. Norton & Company, 1977, 171-178 ("21. Size and Shape") (sp. 173).

# LE STATUT ONTOLOGIQUE DE LA MATIERE DANS LES THEOLOGIES DE LA CREATION A PRAGUE (1390-1410): LES HERITAGES D'AUGUSTIN ET DE JOHN WYCLIF

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## Introduction

La Bohême, aux confins des XIVe et XVe siècles, connaît durant quarante ans (1380-1420) une période mouvementée de son histoire, sur le plan idéologique comme théologique et doit ses élans de rébellion et ses tentatives de réformes éclésiastiques à la puissante influence des œuvres de John Wyclif sur quelques grandes figures universitaires contestataires pragoises comme Jean Hus et son disciple Jérôme de Prague (Smahel 1980). Prague est la première université d'Europe Centrale dotée des mêmes statuts que ceux de Paris et les prédecesseurs comme les successeurs de Jean Hus (Smahel 2010) sont profondément liés à cette première université, pour y avoir fait une partie de leurs études ou y avoir enseigné (comme Charles IV, fondateur de l'université), et à Oxford, pour avoir traduit ou intensément lu les œuvres théologiquement subversives de John Wyclif (Herold 1987, Hudson 1997). Cet engouement s'exacerbe avec le grand Schisme d'Occident et le Concile de Constance. Les cercles hussites ont revendiqué une conception du monde et de la création, forte et originale, où les idées platoniciennes, connues par Augustin, occupent une fonction essentielle dans le dessein divin et sa réalisation. Les formes platoniciennes acquièrent progressivement, au cours des discussions menées par ces cercles restreints et rebelles, le statut d'universaux et sont envisagées avec une certaine autonomie d'existence.

Ces théologies de la création dérangeantes, qui admettent des transcendantaux sur un mode très réaliste, comme des exemplaires accomplis, sans lesquels les êtres sensibles n'auraient pas leur raison d'être, bouleversent aussi les conceptions

traditionnelles de la matière, habituellement proche du non-être, familière de l'indicible et de l'indéfinissable. En affrontant le monde à son commencement, la pensée de la création hussite, riche de ses sources wyclifistes et augustiniennes, entend restituer chaque étape de son déploiement, pour reconnaître finalement à la matière une densité ontologique sans précédents.

Nous souhaitons aujourd'hui présenter l'importance ontologique de la matière telle que John Wyclif l'a conçue dans sa lecture du platonisme augustinien, et telle qu'elle a été reçue dans les théologies pragoises de la création.

Dans une première partie, nous décrirons les origines du réalisme de Wyclif et la place centrale de la matière dans la construction de ce réalisme, mobilisé dans les concepts de la création.

Dans un second et dernier moment, nous relèverons trois problématiques ontologiques de la matière présentes dans plusieurs questions quodlibétales de Jean Hus (Ryba 2006) et réprésentatives de l'augustinisme et du platonisme wyclifistes.

## Les origines philosophiques et théologiques du réalisme de John Wyclif : l'importance du platonisme et de l'augustinisme dans la conception du monde en Bohême

*Aperçu des principales traditions polémiques connues issues de la réception médiévale des idées platoniciennes*

Le réalisme de Wyclif (Cesalli 2007) et sa dynamique sceptique connait une forte adhésion chez les maîtres de Jean Hus (Smahel 1983), Jean Hus lui-même et Jérôme de Prague. Wyclif met face à face la vérité des Ecritures et l'expérience ordinaire de l'Eucharistie qui constitue un défi sceptique : si l'on accepte le dogme de la transsubstantiation, on renonce à savoir quelle substance se trouve sous les accidents sensibles. Il vaut donc mieux suivre ce que nous enseignent les sens selon Wyclif: dans l'Eucharistie, ce que nous voyons est bien du pain.

Grand adversaire du nominalisme d'Ockham (Cesalli 2007), selon lequel la réalité provient uniquement du singulier et n'est connaissable que par voie propositionnelle, Wyclif diffuse et revendique en terre tchèque la doctrine augustinienne des idées platoniciennes : c'est-à-dire que les idées sont des causes, des formes et des vérités éternelles, modèles séparés des choses singulières. Dans son traité *De Ideis*, cap. I, f°. 38ra, John Wyclif affirme :

"Idea, quid nominis tali, significat rationem exemplarem aeternam apud Deum, secundum quam Deus est productivus rei ad extra." (Herold 1997)

Il reprend ainsi le passage de saint Augustin, *De diversis quaestionibus LXXXIII*, *De Ideis*, qu. 46 :

"Sunt namque ideae principales quaedam formae vel rationes rerum stabiles atque incommutabiles, quae ipsae formatae non sunt ac per hoc aeternae […] quae divina intelligentia continentur. Et cum ipsae neque oriantur neque intereant, secundum eas tamen formari dicitur omne quod oriri et interire potest et omne quod oritur et interit." ( Mutzenbaecher, 70).

Pour Wyclif, toute créature a son être éternel, vital, intelligible dans l'esprit divin, même l'âne est en quelque sorte Dieu, comme il le soutient dans son *De Ideis*, cap. II, f°. 43rb :

"Et si dicatur male sonat concedere asinum et quodlibet aliud esse Deum, conceditur aput aegre intelligentes. Ideo multi non admittunt talia, nisi cum determinatione, ut talis creatura secundum esse intelligibile vel ideale, quod habet a Deo ad intra est Deus. " (Herold 1997).

Wyclif ajoute dans son *Tractatus de Universalibus* :

"Probabilius tamen videtur mihi quod Plato sane sensit de ideis cum Scriptura nostra, sicut de eo Augustinus testatur." (Kenny 1985, 60-61)

En Bohême, circule ainsi un platonisme direct par les sources calcidiennes et chartraines (une importante bibliothèque manuscrite est disponible à Prague sur le commentaire du *Timée* par Calcidius et Bernard de Chartres, Guillaume de Conches, Jeauneau 1979, Spunar 1985) mais aussi un platonisme indirect par Augustin. Ainsi, les idées platoniciennes d'Augustin, telles qu'elles sont reçues par les universités médiévales de l'occident latinophone, questionnent à Prague les modes de séparation et d'abstraction de ces fondements matriciels divins présents au monde terrestre, actifs en Dieu et dans l'esprit divin et, de façon discutée, dans l'esprit humain. Les Idées platoniciennes concourent à l'élucidation de la triple dimension ontologique des créatures : leur être en Dieu, leur essence causale, leur existence temporelle.

Auparavant avec Albert le Grand et Henri de Gand (Sturlese 2003), le débat sur la connaissance, issu des lectures du traité augustinien du *De civitate dei (VIII, 4, 8)*, constitue un vecteur important de l'augustinisme et du platonisme à l'Université de Paris : Platon n'a pas vraiment soutenu que les formes idéales existaient en-dehors de dieu, car ce serait un sacrilège de déposséder le démiurge de son propre modèle, qu'il suivrait en dehors de lui-même. Le Créateur serait dépendant d'une cause extérieure à lui-même. Conformément à Augustin, Henri considère plutôt les idées ou essences comme des exemples dont la matrice est procurée par Dieu lui-même. Platon ne sépare pas les universaux des choses concrètes, mais les place dans la connaissance de l'esprit,

où elles ont une nature d'universaux et non de singuliers. Les idées fonctionnent comme des principes cognitifs, pour connaître les formes particulières qui existent dans la matière. Elles représentent aussi un second mode de la nature, à la fois effet et cause de la création.

*Principaux enjeux théologiques du réalisme de Wyclif : le rôle des idées dans la création du monde*

Le réalisme de Wyclif s'élabore surtout à partir de la fonction des Idées dans l'acte de la création subite et simultanée de l'*esse* (*De Ideis*, *De Genesi ad literam IV, V*) : les Idées sont des universaux créés, des causes secondes précontenues dans l'être, au centre de la formation des choses particulières.

Wyclif semble connaître aussi le *Contra Academicos* III, 17-37, où Augustin envisage deux mondes, l'un intelligible dans lequel réside la vérité, et le sensible, fait à l'image du premier. La vérité ne peut s'acquérir que dans cet archétype divin idéal. En tout état de cause, la catégorie centrale retenue par Wyclif dans la théorie des idées est bien le monde intelligible augustinien qui devient directement le monde archétype des pragois.

Suivent de très nombreuses questions quodlibétales vivement disputées, qui examinent le monde archétype et se demandent dans quelle mesure il répond de la réalité du monde sensible : "Si le monde archétype est une multitude d'idées reposant éternellement dans l'esprit divin", "si le monde archétype est la cause du monde sensible", "s'il existent des formes universelles" (Smahel 1980).

Le contexte délétère précédemment décrit est aggravé par la christianisation des idées platoniciennes au sein des théologies trinitaires de la création, qui intègrent les vérités de la Genèse. Dieu crée tout dans le commencement, c'est-à-dire dans le Fils, modèle et raison idéale de toutes choses. Les formes platoniciennes, à la fois extérieures aux choses et à Dieu, deviennent progressivement des universaux divins qui préexistent aux choses sur un mode d'unité transcendant. Dès lors, Jean Hus et aussi Jérôme de Prague posent la nécessité conceptuelle d'une distinction formelle entre les idées divines et entre elles et Dieu, tout en étant inhérentes au Créateur.

Assimilés à des *formalizantes* qui prendraient en compte les idées platoniciennes originaires comme universaux séparés, existant *in re extra Deum*, hors des singuliers et hors de l'intellect divin, ces cercles sont fustigés comme hérétiques : Jean Gerson, anti-platonicien notoire, chasse Jérôme de Prague dès 1405, hors de l'université de Paris, puis participe à sa condamnation pendant le Concile de Constance dix ans plus tard (Kaluza 1997, 1984, Pavlicek 2011).

En retour, ces dissidents voient leurs nombreux opposants comme autant de dialecticiens hérétiques diaboliques, qui n'envisageraient pas, comme la tradition

augustinienne l'exige, des idées séparées, éternelles et vraies, mais y liraient au contraire la désolante traduction de simples signes du monde créé. En effet, il est inadmissible d'envisager que de telles substances soient compatibles avec la création, car il faudrait alors qu'elles commencent *ad extra* dans le monde.

Les cercles pragois s'efforcent d'étayer, au cœur de la création, la nette séparation entre les idées, comme exemplaires, et les choses créées, comme conformes à leurs exemplaires (Herold 1998). Bien plus, Dieu, éternel et incréé, admet ces idées en lui, à la fois identiques à lui et distinctes. Elles doivent ainsi être nécessairement inhérentes à une "substance supersubstantielle" et dans cette inhérence, elles obtiennent une distinction formelle. Essentiellement, les idées sont intégrées à Dieu et formellement, elles sont différentes de lui.

Chez Jean Hus, dans son *Quodlibet*, "*Utrum a primo ente intellectivo et inmutabili, omnipotenti, omniscienti dependeat optima disposicio universi*", le modèle ontologique importé d'Augustin par Wyclif est omni-présent. On note l'intériorisation intellectuelle divine et l'éternelle anticipation prévoyante sur sa création –*praeintelligit, previsio*- qui donnent lieu à une véritable méthodologie de l'exemplaire, d'une forme qui permettra la mise en ordre du monde :

"*Disposicio exemplaris universi est*. Probatur : Deus prius ad intra in mente sua disponit intellectualiter mundum extra ipsum disponibilem, quam ad extra ordinet causaliter ; igitur est disposicio ad intra in mente Dei exemplaris, per quam ad extra mundum potest disponere. Et antecedens probatur, quia Deus preintelligit et previdet in mente sua ad intra, qualiter universum, ab eo disponibile ad extra et ordinabile, disponat ad extra et ordinet ; talis autem preintellecionis et previsionis et ordinis terminus ad intra in mente divina est intellectualis et exemplaris disposicio universi ; igitur conclusio vera. Deus sapiens prevideat et preintelligat ad intra, qualiter aut quomodo posset mundum a se ordinabilem ordinare, nisi prevideat ad intra quale aut modum seu formam, scilicet exemplarem, qua previsa et preintellecta ad intra sic prevideat et preintelligat. Igitur correlarium stat in forma". (Ryba 2006, 25, 26).

Bien plus, Jean Hus, dans *Quodlibet*, "*Utrum simpliciter necessario multitudo ydearum prerequiritur ad multitudinem productorum*", évoque un Dieu augustinien omniscient, sur un mode simple et synthétique, sans division, sans analyse :

"Simpliciter necessario Deus eternaliter habet distinctas raciones omnium productibilium, sed ille sunt multitudo ydearum; ergo questio vera. […]. Cum ergo absolute necessarium sit quamlibet ydeam esse, sequitur, quod absolute necessarium est Deum scire quodlibet scibile in sua ydea". (Ryba 2006, 207, 208).

Avant Zénon Kaluza (Kaluza 2003), on pensait que le réalisme wyclifiste et le réalisme réifié dérivé de l'ontologie des Idées platoniciennes étaient l'origine des débats théologiques sur la suspicion de coexistence entre Dieu et les Idées éternelles dans la création, car ils alimentent une réinterprétation de la doctrine platonicienne des idées, une affirmation des universaux réalisés dans les singuliers, une logique qui postule la priorité des choses et des proportions réelles, par rapport aux signes et aux diverses espèces de propositions, de pensées, proférées ou écrites.

Or, c'est tout le contraire. La théologie réaliste de la création wyclifiste s'inscrit plutôt dans un itinéraire, de la matière aux universaux platoniciens[1].

*Le réalisme de Wyclif et son enracinement dans la conception augustinienne de la matière (Livres IV et V du 'De Genesi ad litteram')*

Le réalisme de John Wyclif s'enracine dans le statut théologique de la très grande matière platonicienne du *Timée*, qui traverse les principaux questionnements cosmologiques et physiques de son œuvre.

En effet, chez Wyclif, la *materia prima* est le premier être créé, elle est éternelle relativement à notre monde, elle contient la totalité des causes de ce qui est, a été, ou sera, elle représente aussi l'élément stable et constant présupposé par tout changement. C'est un lieu où sont déposées les *rationes seminales* de l'ensemble des créatures, sorte de patrimoine génétique. Cette première et totale créature est l'*esse potentiale*, être analogue par rapport à toute chose, deuxième type d'être distingué par Wyclif à côté de l'être d'existence, de l'être intelligible en Dieu et de l'être accidentel de la substance. Elle est aussi l'essence matérielle de toute chose, car la matière de toute créature provient de cette première matière. (Wyclif s'appuie sur un platonisme direct concernant le *Timée* mais de nombreuses lectures platoniciennes du *Timée* sont indirectes apparemment et sont copiées de R. Grosseteste, le tenant lui-même d'Eustrate de Nicée).

Comme Augustin, Wyclif reconnaît la matière première comme une vérité révélée, il soutient qu'au premier instant du temps, Dieu crée l'ensemble de la nature corporelle,

[1] L'existence des idées divines en dehors de toute réalité individuelle et en dehors de l'esprit humain est admise par tous les théologiens et les logiciens, de sorte qu'elle n'entre pas dans la querelle des universaux. Le statut ontologique des idées divines ne peuvent faire le départ entre les nominalistes et les réalistes : Platon peut inspirer au Moyen Âge un réalisme théologique, mais l'on peut être platonicien sans pour autant être un réaliste logicien (Erismann 2011, 57, 65). Cependant, les idées divines, dans la mesure où elles traduisent l'affirmation d'universaux immanents sous le forme de natures communes, interrogent les modes d'instanciation de l'universel. Quand l'Universel n'est instancié d'aucun individu, on se réfère à Platon, quand l'Universel est instancié, on se réfère plutôt à Aristote. Dès lors, la théologie platonicienne médiévale (dont l'objet est Dieu, être séparé en soi) contribue à établir les fondements de la métaphysique dont le sujet est l'*ens commune*, être obtenu par abstraction (Boulnois 2002, 79,80). Par conséquent, comme c'est le cas pour Wyclif et les cercles pragois, on a recours aux discussions sur les universaux, on explore les liens premiers d'abstraction et de séparation des entités intellectuelles et divines pour chercher des structures conceptuelles qui aideraient à comprendre les doctrines de la création (Maieru 1981). C'est donc le statut de la matière au commencement, les éléments de la création qui questionnent la nature des substances universelles et non l'inverse.

c'est-à-dire qu'il divise en ciel et terre la matière informe, il la divise donc en créatures spirituelle et corporelle. Par cet acte, Dieu crée tous les corps selon l'essence et y dépose les raisons causales. Ces raisons causales sont les causes matérielles et universelles des singuliers qui vont être appelés à être ordonnés.

Il y a donc une double création augustinienne reprise par Wyclif dans son *De materia et forma*, 5-16 et 7-10, une première création simultanée, subite *ex nihilo* et une seconde création ou *administratio* :

"Secundo suppono auctorem nature in primo instanti temporis creasse universam naturam corpoream, cuius unam partem formavit in celum, aliam in terram [...]. Patet illud ex irrefragabili testimonio testimonio Sacre Scripture Gen. I° 'In principio Deus creavit celum et terram, cum exposicione sanctorum et specialiter sancti Augustini, 12° de Confessione, ubi subtiliter et philosophice declarat illam sententiam. [...] Patet prima pars ex hoc, cum non possit esse, nisi fuerit a tota trinitate, et per consequens ordinata, moderata et formosa ; cum igitur esse tale ponit formam analogam (ut patet saepe per Augustinum)". (Thomson 1983, 192, 207).

Quand Wyclif pense les différentes étapes de la création et le problème du commencement, des idées divines, surgit la création des genres et des espèces produisant des modèles ou raisons causales ou *rationes seminales*, qui constituent une sorte de matière primordiale (être analogue ou *primum creatum* du *Liber de Causis*) à partir de laquelle peut se faire la création des singuliers (*administratio*).

Dès lors, on peut esquisser toute la grandeur et l'indigence ontologiques de la matière :

D'un côté on obtient finalement, par la réception wyclifiste du *De Ideis* d'Augustin, trois états ontologiques de la matière correspondant à trois états de l'intelligible d'inspiration néoplatonicienne : i) la *materia prima/maxima/informis* correpondrait aux universaux *ante rem* (chez Augustin et Wyclif : les idées divines essentiellement identiques à Dieu) ii) la forme analogue ou *esse potentiale* correspondrait aux universaux *in re* c'est-à-dire des modèles créés des choses, génériques et spécifiques qui surgissent dans la première création instantanée et simultanée (chez Augustin, ce sont les *rationes seminales*), iii) la *materia in compositio* correspondant aux universaux *post rem*, toutes les choses singulières créées.

Ces trois états de la matière, qui ne sont pas présentés de façon systématique chez Wyclif, manifesteraient des compatibilités avec l'ontologie de Plotin, de Boèce et de Thierry de Chartres (car le lien entre Augustin et Plotin n'est pas établi, il manque un intermédiaire mais il y a bien une même préoccupation à propos de l'identité de l'intelligence et de son objet (*Ennéades* I, 6 (1), V, 1 (10), 3, 5) (Pépin 1992).

Cette superposition des différents êtres de la matière et des intelligibles s'inscrit aussi dans la division des universaux d'Eustrate de Nicée, lui-même repris ensuite par Grosseteste. Les êtres "séparés des choses singulières" sont assimilés aux idées divines situées en Dieu. De Grosseteste, Wyclif retient finalement les trois grands types d'universaux, les idées incréées, les créés et les causaux contenus dans les intelligences et les corps célestes, les genres et les espèces fondés dans les singuliers.

D'un autre côté, dans l'œuvre logique de Wyclif, ce statut ontologique de la matière est inconstant, il entraîne des glissements voire des superpositions sémantiques *maxima materia platonicienne/ materia prima aristotélicienne/ materia informis augustinienne*, au moment où Wyclif souhaite définir le monde comme un lieu total ou lieu-réceptacle, complet, éternel et immobile, multipliant et réunissant l'intégralité des lieux disponibles pour les corps, toujours soumis aux mêmes lois et gouverné par la nécessité –causes immobiles de la nature-.

Ces flottements soulignent que les correspondances entre les êtres de la matière et les êtres intelligibles sont très précaires et ouvrent à des questionnements qui touchent directement au mystère de la création : qu'est-ce qui marque la distinction dans la matière entre la part corruptible et la part éternelle des êtres, dans la mesure où la matière semble un élément invariant appartenant à l'intemporalité et au devenir lors de la création ? Dieu créé t-il du néant ou créé t-il à partir d'une matière préexistante ? Comment peut-on accorder à la matière un statut formel d'être premier ?

Wyclif soutient à la fois que la matière a été créée au premier instant du temps et qu'elle a été créée avant cet instant et hors du temps. La création première n'est cependant pas située dans le temps, tantôt elle est dotée de la priorité de nature, tantôt de l'intemporalité. Dieu, par nécessité, présuppose la matière mais ne produit pas à partir d'elle ni à partir d'un principe matériel.

Bien plus, selon la pensée de Jérôme de Prague après Jean Hus (Kaluza 1994), la matière devient un premier être créé, extérieur à Dieu et face aux Idées, recevant en lui pour les conserver les quiddités modelées sur les Idées. Le monde des idées ou *mundus archetypus* constitue le modèle du monde perceptible par les sens, dont les êtres immuables sont conservés dans la matière.

La réception wyclifiste des idées platoniciennes vues par Augustin engage donc une pensée de la création où la matière surgit presque d'emblée car elle est constituée par les modèles des choses à venir : la matière demeure inexorablement, comme dans la tradition du *Timée*, une errance.

Dans la solution mythique transitoire du *Timée*, les choses sensibles se trouvent dans une sorte de milieu-matériau, de quoi elles sont faites et en quoi elles se trouvent,

modelée par le démiurge. Ce dernier la travaille comme un matériau artisanal, en gardant les yeux fixés sur les formes intelligibles, et en introduisant dans son ouvrage les formes les mesures et les rapports mathématiques, qui y assurent ordre, stabilité, et permanence. Puis le démiurge se met à l'écart, l'âme du monde prend le relai du fait de sa situation intermédiaire entre intelligible et sensible (*Timée* 35a-b). Nous avons donc des formes intelligibles, qui sont en soi immuables et universelles, et des choses sensibles, images des formes intelligibles confiées au matériau, reflétées par le matériau ; en lui, apparaissent puis disparaissent les manifestations. Les propriétés distinctes qui gardent leur identité entrent dans le réceptacle du devenir puis en ressortent et sont qualifiées "d'imitations de réalités éternelles". Ce ne sont pas pour autant des formes intelligibles.

La matériau rend compte de la différence irréductible entre l'image et son modèle, mais se disqualifie comme objet de l'intellect[2].

Voyons comment ces problématiques théologiques et ontologiques resurgissent chez Jean Hus.

## Présence de la matière wyclifiste et augustinienne dans les questions quodlibétales de Jean Hus : l'ontologie problématique de la matière dans la théologie de la création

Chez Jean Hus, ces problématiques sont articulées en trois points.

Ses *Quodlibeta* traduisent d'abord le problème de la rivalité ontologique entre Dieu et la matière : une des grandes préoccupations d'Augustin consiste à reformuler en termes chrétiens la conception démiurgique de la naissance de l'univers. Augustin rejette d'ailleurs contre Platon un monde créé et coéternel à Dieu ; il conteste la coéternité du monde avec Dieu. Dieu doit rester le créateur qui a tout fait du néant (Bouton-Touboulic 2004). Dans le *De fide et symbolo*, il rappelle qu'il ne faut aucunement penser que cette matière, dont a été fait le monde, pour informe, pour invisible qu'on le veuille, et qu'elle qu'en fût la nature, ait pu être par elle-même, coéternelle et coexistante à Dieu. L'éternité est l'attribut divin par excellence et le propre de la créature est de ne pas toujours avoir existé.

[2] Paradoxalement, dans le *Timée*, jamais le matériau ne présente cette indétermination que réclame sa définition. Toujours s'y manifeste la nécessité, cet enchaînement purement mécanique de mouvements qui entraîne les quatre éléments. Avant l'intervention du démiurge, le matériau se trouve agité par un mouvement dépourvu d'ordre du fait de l'hétérogénéité des éléments qui la composent. (52d-53b). La nécessité ne s'oppose pas au hasard, c'est une "cause errante". Quand Dieu est absent, voilà dans quel état on trouve toute chose. La nécessité (56c) ne s'oppose pas systématiquement à l'action du démiurge, mais elle lui impose ses containtes (75c). Le matériau indissociable de la temporalité, peut se modifier sous l'action de la persuasion.

Pour Jean Hus, comme il l'affirme dans son *Quodlibet*, "*Utrum Deus, qui creavit mundum sensibilem in primo instanti temporis, potuit ipsum prius producere et communicare creanciam alicui creature*", Dieu seul détient la prévision éternelle de sa création et l'ordre à y instaurer –*preordinancia*-, cause finale et cause première *causantia*, il procède seul à l'idée et au projet de création –*creantia*-, et comme chez Augustin, le but est de rejeter une causalité génératrice de la matière :

"Nam preordinancia mundi est eterna ; igitur causancia vel creancia. Tenet consequencia, quia ipsa preordinancia est causancia." (Ryba 2006, 83)

Il précise même la distinction entre un 'primum ens', puissance essentielle de création, et l'être de la matière, qui ne relève pas de la même puissance. Jean Hus mobilise la pensée augustinienne de la création tout en usant des principes métaphysiques aristotéliciens de la puissance :

"Primum ens est inmense potencie essentialis principiandi, agendi, faciendi et conservandi. Patet, quia esse potencie essencialis principiandi, agendi, faciendi et conservandi est melius et dignius quam esse non hujusmodi potencie et per consequens primum ens est potencie essencialis principiandi, agendi et conservandi […]." (Ryba 2006, 18)

Deuxièmement, Jean Hus recourt à l'ordre augustinien et au statut métaphysique de la matière aristotélicienne.

En Aristote, Wyclif pense trouver une solution et c'est aussi le cas chez Augustin, où la matière aristotélicienne devient centrale dans l'*administratio*. En effet, le Stagirite a conservé tout à la fois une matière première incorruptible et un composé substantiel de matière et de forme, soumis à la génération et à la corruption.

En conséquence, Wyclif désigne la matière incorruptible *per se*, pure potentialité, non plus comme *materia prima* mais comme *materia informis*, c'est-à-dire la matière informe augustinienne, encore marquée par une certaine confusion (l'informité de la matière est déduite des motifs de la terre et des ténèbres). Ce même itinéraire est suivi par Jean Hus :

"Arguitur quod non : Nam materia prima nec est quid nec quantum nec quale -7° Metaphisice ; ergo non est compositum. Et materia prima nullam habet formam omnino, ut dicit Commentator 1° Metaphisice ; igitur materia prima est informis. […] Triplex est substancia, scilicet materia, forma et compositum ex hiis, ut dicitur 2° De anima ; ergo materia prima cum forma est idem compositum et ipsa est informis dicente Commentatore 1° Physicorum : "materiam nullam habet in se formam sed est in potencia ad omnes". […p. 222] Materia non est unum cum forma. Assumptum probatur. Nam Philosophus 5° Metaphisice, capitulo de uno, distinguens modos unius, scilicet

unum numero et unum forma, unum genere et unum analogia ait, quod illa sunt unum numero, quorum est una materia." (Ryba 2006, 219, 222).

Dans ce passage, Jean Hus semble parfaitement maîtriser un aristotélisme scolaire mais en réalité son propos traduit une innutrition augustinienne de tous ces concepts aristotéliciens : dans cette question, nous avons donc un exemple patent de ce qu'est la coexistence du platonisme des idées avec l'aristotélisme des substances.

En effet, Aristote bien sûr ni même Averroès ne parlent jamais de matière informe. Même si la matière est le sujet constant de toutes les générations, réceptacle, essence unique pour toutes les formes qui lui donnent l'existence d'un singulier dans un genre et une espèce, ils n'identifient jamais la matière à cette ressource essentielle qui procure la forme, le genre et se présente comme un être analogue.

Chez Augustin, à la suite de la *materia informis*, vient une matière fabricable, générable, aristotélicienne, plus plastique en vue de l'*administratio*, qui finit d'accomplir sa destinée : être mise en ordre, car c'est à Dieu que revient la disposition selon la mesure, le nombre et le poids. Augustin reprend ainsi le *Timée* 52d-53b.

L'ordre n'intervient qu'avec la forme, l'attribution de forme obéit à un ordre : de la matière confuse et informe doit provenir ce qui est distingué et formé. (*Confessions*, XII, 4, 4). L'ordre du monde exige la forme et c'est tout ce que n'est pas la matière. Le monde a été éternellement en ordre, et si, selon Augustin, Platon a d'abord considéré isolément le substrat matériel inordonné, c'est pour nous faire saisir que la nature du corporel en elle-même sans ordre, est de recevoir l'ordre, grâce à l'action d'une cause divine. Le statut de la matière résulte donc de cette difficile équation, car elle n'est ni forme ni néant.

Ainsi, la matière répond à un double statut chez Wyclif, tel qu'il comprend Augustin : elle ne peut être formée que parce qu'elle est informe en dehors du temps et elle n'a de raison d'être dans sa nature informe que si elle est formée. Créée par la trinité, l'être de la matière informe présente une perfection et une forme, mais une forme analogue, en dehors de tout genre, hors des réalités concrètes. La matière présente ainsi deux formes, car la notion d'ordre dénote les deux moments de la création : la première forme est analogue dans la *prima creatio* et l'autre substantielle, aristotélicienne, dans l'*administratio* et dans le temps :

Dans son *Quodlibet*, "*Utrum a primo ente intellectivo et inmutabili, omnipotenti, omniscienti dependeat optima disposicio universi*", Jean Hus évoque une forme double, une forme exemplaire, qui pourrait correspondre à l'être analogue de la matière, et une forme de la chose, qui se trouve en dehors de l'existant, qui ne lui confère pas son degré d'être et qui pourrait correspondre à l'exemplaire mental *in mente Dei* :

"[…] Et dicitur disposicio quasi diversimoda vel diversorum aut disparium posicio in gradibus vel locis suis essencialibus. Et sicud forma ponitur duplex, alia exemplaris rei, alia formaliter rei inexistens : sic disposicio exemplaris dicitur, per quam res habet poni in gradu aut loco essenciali varie ad alterum, disposicio autem formaliter inexistens dicitur, secundum quam res habet sic poni". (Ryba 2006, 23).

Là encore, la rivalité ontologique Dieu/matière est à souligner, puisque la disposition exemplaire partage un aspect de sa nature avec *la forma rei inexistens*.

Il ajoute même dans son *Quodlibet*, "*Utrum Deus, qui creavit mundum sensibilem in primo instanti temporis, potuit ipsum prius producere et communicare creanciam alicui creature*":

"Oportet dici quod mundus est primum creatum formaliter, quia primo sibi debetur creacio formaliter passiva, quae in ipso formaliter subjectatur". (Ryba 2006, 84).

Dans ce passage, la formation du monde désigne probablement l'état de la matière, l'adjectif *passiva* est significatif et décrit une création qui se donne et se repose dans la matière comme dans un sujet, lors de la première phase de la création.

Jean Hus, enfin, reprend dans sa théorie de la création, les motifs de la bonté de la matière augustinienne.

En étant orientée vers la forme, la matière présente une bonté. Augustin dit ainsi dans le *De vera religione* 18, 36 : "Cette matière a été tout entière faite du néant. En effet, même ce qui n'a pas encore reçu sa forme est, d'une certaine manière, ébauché pour la recevoir. Cette capacité à recevoir la forme est un bienfait de Dieu puisque sa possession est un bien. La capacité à recevoir la forme est donc aussi un certain bien et par conséquent l'auteur de tous biens, qui a donné la forme, a donné aussi la possibilité d'être formé"**.**

La doctrine augustinienne (*Cité de Dieu* X, 31, XII, 13) (*Confessions* XI, 5, XII, 8) à la quelle se conforme Jean Hus, suit la doctrine platonicienne sur le motif d'une création, qui n'est autre que la bonté de Dieu lui-même[3].

Dans son *Quodlibet*, "*Utrum materia prima est idem compositum in numero cum forma an informis*", Jean Hus reprend pleinement ce motif augustinien :

"Quam cito materia, sive eternaliter, sive temporaliter, est, tam cito est bona ; sed cum omnis bonitas rei sit eius forma, sive sit substancialis, sive accidencalis, igitur materia prima non est informis. Maior ex eo patet, quod cuiuslibet esse consequitur

[3] Pour Augustin, le monde visible a un âge fini d'environ 6000 ans. Le motif de la création, c'est la bonté de Dieu, et il comprend l'expression biblique *In principio* comme la désignation du Verbe de Dieu et du commencement du monde. La date du premier instant, c'est l'effet de la volonté éternelle et de sa bonté. Celle-ci lui permet d'établir une compatibilité entre un temps fini et l'éternité divine. Il y a un monde sans commencement, qui ne connaît pas de premier instant mais qui subit perpétuellement l'effet absolu d'un Dieu bon et volontaire.

bonitas. Et sic minor probatur : Nam sive accipiatur bonitas pro bonitate substanciali scilicet essenciali, sive accidentali, necessario bonitas illa est forma. Item Philosophus 1° De generacione dicit : "Materia nunquam separatur ab omni forma". Et Commentator 1° Phisicorum dicit : "Materia prima non potest separari ab omni forma"". (Ryba 2006, 221)

La matière est bonne, et il concède que l'on doit l'envisager du point de vue temporel et du point de vue éternel. Le bonté éternelle se manifeste quand Dieu procède à la mise en ordre des êtres, et à l'attribution de leur forme. La matière est donc ici tout à fait assimilée à la forme et on assiste à de profonds déplacements de la métaphysique aristotélicienne et des croisements audacieux entre Wyclif, Augustin d'un côté et Aristote, Averroès de l'autre. Ainsi, en effet, la matière première n'est pas informe, car nous nous situons au niveau de l'*administratio*. La bonté est donc la forme première de la matière qui confère aux êtres leur substance et leurs accidents. Il faut donc noter le rapprochement surprenant dans les deux dernières lignes du passage cité ci-dessus: Aristote dit bien que la matière n'est séparée d'aucune forme, dès lors qu'il s'agit d'une matière composée, et non plus la *materia prima* ; ce n'est donc pas du tout la conception de la matière selon Averroès, qui discute en fait une position d'Avicenne, avec lequel il n'est pas du tout d'accord. Avicenne en effet soutient que la matière première est dotée par essence d'une forme de corporéité inséparable d'elle, qui permet d'attribuer les trois dimensions de longueur, largeur et profondeur aux corps. Pour Averroès, si tel est le cas, alors on ne respecte plus la valeur métaphysique de la matière première indéterminée d'Aristote (Donati 1988).

## Conclusion

La matière occupe une place centrale dans les théologies de la création et ne se laisse pas oublier, quand on considère le monde et ses merveilles. Evoquant la densité des créatures, elle soutient la profondeur d'une pensée, qui, à Prague, tente de saisir la consistance de la voûte intelligible et de mesurer les vues pénétrantes de la bonté de Dieu. Sur le fil précaire de l'être et du non-être, aux frontières immémoriales du premier instant, elle gagne pourtant progressivement un statut essentiel dans la dotation des êtres à venir, pourvu qu'elle se laisse dompter par l'ordre et ne s'invite pas, avec trop d'insistance, sur les rives exemplaires des *ideae divinae*.

Forme analogue, forme spécifique ou substantielle, être insaisissable et plastique, la matière pragoise propose une possible voie d'accès entre les sensibles et les intelligibles et invite à exercer son regard sur le monde et la générosité de son modèle.

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# NICHOLAS OF CUSA AND HIS CONCEPTIONS REGARDING THE NATURE OF NUMBER AND THE CONSTITUTION OF THE UNIVERSE

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## Introduction

Nicholas of Cusa or Cusanus (1401-1464) was a humanistic scholar, a church reformer who tried to reconciliate the Orthodox and the Catholic Church[1], a papal diplomat and a cardinal. Moreover he was a neo-platonic philosopher and theologist as well as a mathematician, who emphasizes the importance of this science as a necessary instrument in order to approach the theological and non theological metaphysical domains[2]. Kepler deeply estimated his works and named him divine, *«divinus mihi Cusanus»*[3]. A vanguard thinker, who considered that there is a life on other planets, constitutes, a very interesting topic to study. In 2008 my paper regarding Cusa's conceptions on the nature of number was published in the review *Philosophia* of the Academy of Athens[4]. Since then I continue to work on this transitional figure, who couldn't attend the modernity, but when his collected works were edited in Paris by Jacques d'Étaples in 1514, attracted the interest of Kepler, Descartes and Leibniz.

## Short biographical sketch

Cusa was born in 1401 in Kues, on the Moselle river. In 1416 he began his studies at the University of Heidelberg and a year later left Heidelberg for Padua, where he spent six years studying at the University law, mathematics, astronomy and physics. In Padua he

[1] See f. ex. *De concordantia catholica* 1434.
[2] J. Hopkins, «Nicholas of Cusa (1401-1464): first modern philosopher?» *Midwest Studies in Philosophy.* Vol. XXVI 2002, p. 16.
[3] J. Kepler, *Mysterium Cosmographicum.* Tübingen 1596, p. 15.
[4] Ch. Phili, «The concept of number in the work of Nicolaus Cusanus» *Philosophia* Academy of Athens Vol. 38 Athens 2008, pp. 180-187 (in Greek).

had the opportunity to become close friend with Giuliano Cesarini (1398-1444), later president of the council of Basel[5] and with Paolo dal Pozzo Toscanelli[6] (1397-1482) a distinguished mathematician, astronomer[7] and cartographer[8].

This close friendship was twice revealed in Cusa's writings. Thus he dedicated his treatise *De transformationibus geometricis (On geometrical transformations)* 1445: *«Ad Paulum magistri dominici physicum Florentinum»,* while Toscanelli appears as interlocutor with Cusa in a dialogue entitled *De quadratura circuli (On squaring the circle)* 1458[9].

During his stay in Padua, Cusa was connected to a group of Florentine and Roman intellectuals, as M. Ficino, Filelfo, George of Trebizond, Pope Nicholas V as well as with Alberti and Brunelleschi. After this acquaintance with the Renaissance world, he defended his doctorate in canon law in 1423, thus as decretorum doctor two years later completed his studies on philosophy and theology at the university of Cologne.

One of Cusa's principal topics remained the knowledge of the unknownability of the divine (see f. ex *De Deo abscondito* (On the Hidden God 1444-1445). In his treatise, *De Coniecturis* (1440-1444) he completed his main work, *De Docta Ignorantia,* in which denied the possibility of exact knowledge. After his election as cardinal in 1448, Cusa wrote numerous scientific and philosophical works as: *De visione Dei* (The Vision of God), *De mathematicis complementis* (Complementary Mathematical Considerations) *De pace fidei* (The Peace of Faith), *De beryllo* (On the Prism). In 1459 Cusanus was appointed vicar general of Rome and Papal states in the absence of the pontifex. Nevertheless he continued to write: see f. ex. *Reformatio generalis* (the General Reform), *De aequalitate* (On Equality), *De Principio* (On the Beginning) *De cribatione Alchorani* (Sifting the Koran), *De li non aliud* (On the Non-Other), *De ludo globi* (The Game of Spheres), *De apice theoriae* (From the Summit of Contemplation), *De venatione sapientiae* (The Hunt of Wisdom). Cusa died in 1464 in Umbria (Italy).

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[5] For more details see G. Christianson, *Cesarini, the conciliar cardinal: the Basel years, 1431-1438* S. Ottilien: EOS Verlag 1979.

[6] G. Uzielli, *La vita e i tempi di Paolo dal Pozzo Toscanelli.* Roma 1894.

[7] He was noted for his observations regarding comets. It might be stressed that a monument for his astronomical skill exists at the cathedral of Santa Maria del Fiore at Florence in the well known gnomon.

8 Through Gemistos Plethon, who attended the council of Florence in 1439, Toscanelli was acquainted with the writings and mappings of Strabo, completely unknown in Italy at that period. 35 years later Toscanelli advanced his own research on cartography and in 1474 sent a letter and a map to F. Martins, priest at the Lisbon Cathedral. In his map a detailed scheme existed regarding the travels related to spice's trade. The portueguese priest sent this letter to King Alfonso V of Portugal. The original of this letter is lost, but later that map became an object for studies for Ch. Colombus. For more details see A. Cortesao, *História da Cartografia Portuguesa.* 2 Vols Lisboa 1969-1970.

[9] An indirect consequence was that Giovanni Andrea de Bussi, his secretary from 1458 to 1464 encouraged by him, founded after Cusa's death, the first Italian printing shop in the Benedictine monastery of Subiaco.

## Cusa's conceptions regarding the nature of number

In his dedicatory letter to cardinal Giuliano Cesarini, who probably was one of his professors[10] at the University of Padua, Cusa revealed that while he was at sea (November 1437 – February 1438) *«en route back from Greece, I was led (by as I believe a heavenly gift from the Father of lights from whom comes every excellent gift) to embrace – in learned ignorance and through a transceding of the incorruptible truths which are humanly knowable – incomprensibly thing incomprehensibly. Thanks to Him who is Truth, I have now expounded this* [learned ignorance] *in these books, which* [since they proceed] *from* [one and] *the same principle, can be condensed or expanded»*[11]. Thus through his *visio intellectualis* was born his magnus opus, *De Docta Ignorantia* in which the central thought is the coincidence of opposites *(coincidentia oppositorum).*

Cusanus was greatly influenced by the Pythagorean theory regarding the concept of integer number and did not hesitate to declare that Pythagoras is the first philosopher both in name and in fact who considered *«all investigation of truth to be by means of numbers»*[12].

Cusa remained faithful to Philolaus' statement that *«indeed all things that are known have number for it is not possible that anything whatsover be understood*[13]*, or known*[14] *without it»*[15]. We must stress that this aphorism regarding the number, has two «natures». The first is ontological, i.e the number could be conceived as a complex essence, whose elements, the essential essences are the monads. The second nature concerns the number's genesis, arising from the measurement of magnitudes. Naturally the Pythagoreans, who considered the number as principle, *«the principles of all things»*[16] referred to the ontological nature of the number.

But how is it possible to conceive a number, its position in the universe («*composing the heaven of numbers*»)[17], and how is it possible to understand its constitution?

Nicomachus of Gerasa, a true Pythagorean, could answer our questions, as he considered that a divine Craftsman existed, or the Platonic Demiurge who in His intellect (dianoia), the maintained eternal and immaterial, the paradigm of the universe, the

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[10] See the dedication: *«[Nicholas of Cusa] to his own venerable teacher, the divinely beloved and most reverend father, Lord Julian, most worthy cardinal of the holy Apostolic See».*
[11] Nicholas of Cusa, *De Docta Ignorantia* instroduction in Nicholas of Cusa 1932 Vol. 1 ed. E. Hoffman and R. Klibansky p. ix.
[12] N. Cusa, *On Learned Ignorance* A translation and an Appraisal of De Docta Ignorantia by J. Hopkins. Minneapolis 2nd ed. 1990. Book I, ch. 11, p. 19.
[13] It might be stressed that in Greek text the verb is νοεῖν (noein).
[14] In the Greek text the verb is γιγνώσκω (gignosko).
[15] H. Diels, *Die Fragmente der Vorsokratiker.* 1ste Bd. 2e Aufl. Berlin 1906, p. 240.
[16] Aristotle, *Metaphysics* I, 5 986, a 15.
[17] Aristotle, *On the Heavens,* III, 300 a 16.

number: *«All that has been arranged by nature with systematic method in the universe seems both in part and as a whole to have been determined and ordered in accordance with number, by the forethought and the mind of Him that created all things; for the pattern was fixed, like a preliminary sketch, by the domination of number preexistent in the mind of the world - creating God, number conceptual only and immaterial in every way, but at the same time the true and the eternal essence, so that with reference to it, as to an artistic plan, all these things, should be created time, motion, the heavens, the stars, all sort of revolutions»*[18]*.*

Augustine[19] and *«after him Boethius*[20]*, affirmed that... in the mind of the Creator number was the principal examplar of the things to be created»*[21]*.* Of course Cusa followed the old tradition which stressed the divine origin of number, which Aeschylus[22] revealed in his tragedy *Prometheus Bound*:

(455) *Prometheus*: «I gave them (i.e. the men) numbers, that knowledge most to be prized».

Cusanus in his treatise *De Docta Ignorantia* defended the conception that God created cosmos, having as powerful tool, first of all arithmetic, then geometry, music and astronomy, disciplines which constituted the Platonic curriculum as well as the medieval quadrivium. «*Through arithmetic God united things. Through geometry He shaped them, in order that they would thereby attain firmness, stability, and mobility in accordance with their conditions. Through music He proportioned things... (and) as a result it happens that the world machine cannot perish»*[23]*.*

Thus according to the mystic power of number, God created all things in number in an admirable order. *«Number pertains to arithmetic, weight the music, measure to geometry»*[24]. It might be stressed that Cusa according to the Pythagorean music of the spheres, considered that the motions of the stars obeyed a harmonic melody.

It is well known Nichomachus considered that arithmetics constitutes an indispensable factor for education: *«arithmetic, not solely... it existed before all the others in the mind of the creating God like some universal and exemplary plan, relying upon which as a design and an archetypal example the creator of the universe sets in order his material creations and makes them attain their proper ends»*[25]*.* Thus arithmetic exists in

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[18] Nicomachus, *Introduction to Arithmetics.* Ch. six.
[19] *Ad Orosium contra Priscilliamistas et Origenistas* 8. 42 p. 674.
[20] *De Institutione Arithmetica* I,1 14-17, p. 12. Friedlein ed. Leipzig Teubner 1867.
[21] Nicholas of Cusa, *De Docta Ignorantia* I, 11, p. 19.
[22] For more details see Ch. Phili, Mythe et Mathématiques in *Mythe et Justice dans la pensée grecque* ed. by St. Tzitzis, M. Protopapas-Marneli, B. Melkevik. Les Presses de l'Université Laval 2009, pp. 45-57.
[23] Nicholas of Cusa, *De Docta Ignorantia* II, 13, p. 99.
[24] IDEM.
[25] Nichomachus of Gerasa, *Introduction to Arithmetics*.

the dianoia of the creator God as a cosmic and exemplar λόγος, geometry could not exist *«without the numbers»*[26], while astronomy, posterior of the geometry in origin *«attains through arithmetic the investigations that pertain to it, as motion naturally comes after rest – not only because the motions of the stars have a perfectly melodius harmony, but also because rising, settings, progressions, retrogressions, increases, and all sorts of phases are governed by numerical cycles and quantities»*[27].

However his affinity with the Pythagorean theories does not end here. In his treatise *De Coniecturis* he adopted the theory that the world is music, harmony constructed on the tetraktys, dominant power for men and God. Thus Philolaus' hymn for the Decad that: *«The power of the Decad is the principle and guide of all life, divine celestial, everything is unlimited, obscure and fictive»*[28], was reformulated by Cusanus in the following way: *«For 1, 2, 3 and 4 added together, will make 10, which unfolds the numerical power of simple oneness»*[29].

For Cusa the universe could be understood by number, without number *«the distinctness, order and comparative relation, and harmony of things cease»*[30]. Moreover number is responsible for the proportio and harmony between things[31].

Moreover it might be stressed that for Cusanus the presupposition of comparative relation constitutes the comprehension of number:

*«But since comparative relation indicates an agreement in some respect and, at the same time, indicates an otherness, it cannot be understood independently of number. Accordingly, number encompasses all things related comparatively. Therefore, number, which is the necessary condition of comparative relation, is present not only in quantity but also in all things which in my manner whatsoever can agree or differ either substantially or accidentally. Perhaps for this reason Pythagoras deemed all things to be constituted and understood through the power of numbers»*[32].

An ardent partisan of Pythagorean doctrine, Cusanus repeats in his way, what Aristotle had saved:

*«Contemporaneously with these philosophers and before them [Leucippus and Democritus], the Pythagoreans, as they are called, devoted themselves to mathematics; they were the first to advance this study, and having been brought it up they thought its*

[26] IDEM.
[27] IDEM.
[28] Stobaeus 1, 3, 8.
[29] Nicholas of Cusa, *De coniecturis,* II, 2, p. 167.
[30] Nicholas of Cusa, *De Docta Ignorantia.* I, 5. 13, p. 52.
[31] IDEM.
[32] Nicholas of Cusa, *De Docta Ignorantia* I, 1, p. 5.

*principles were the principles of all things. Since of these principles numbers are by nature the first... they supposed the elements of numbers to be the elements of all thing»*[33].

Cusa created an arithmetical series with odd, the Dyad and even, the unity. Thus the three contain the beginning, the middle and the end. The number four, *«which is an unfolding of oneness, contains the power of every number»*[34].

*«From the number ten, which is a second oneness, the squared unfolding of the root [ten] is attained by means of a similar four-term progression: [for] 10, 20, 30 and 40, when added together, are 100, which is the square of the root ten»*[35].

Cusanus followed the same reasoning attended the centenary oneness [i.e. the number 100] and thus «*gives rise to 1000: [for] 100, 200, 300 and 400, when added together are 1000*»[36].

The erudite cardinal basing on this extending tetraktys, goes further corresponding to each fourth levels of reality:

We will try to interpret this hierarchical arithmetical climax, which according Cusa symbolized also the climax of the human mind, as the number could be represented to the human mind, while the arithmetical series conforms to reality. Thus the monad, the first oneness *«it calls God, the root - oneness which has no earlier root of itself it calls intelligence, the third... it calls soul and final gross unfolded solidity... it surmises to be body*[37]*»*[38].

In this phrase resounded Anatolius's conception regarding the monad which is likened to «*the One, the intelligible god, the ungenerated, the beauty itself, the good (ἀγαθόν) itself*»[39].

For Cusa the correspondence of the monad to God, or to 1000 to body did not symbolize God itself or the body itself, but the relation of human mind with them, as they constitute objects of the intelligence. So, according the cardinal this hierarchical arithmetic order is a climax in order to approach the truth:

*«the mind embraces all things either divinely or intellectually or as does a soul or as does a body divinely i.e. according as [what is embraced is truth; intellectually i.e. not insofar as [what is embraced] is truth itself but insofar as it is present truly; as does a soul*

[33] Aristotle, *Metaphysics,* I, 5, 985 b 23 - 986 a 12.
[34] N. Cusa, *De Coniecturis* I, 2-3, p. 167.
[35] IDEM.
[36] IDEM.
[37] IDEM.
[38] Cusa means to include not only the human body but also the entire realm of corporeal objects.
[39] Anatolius, *De Decade,* ed. J. L. Heiberg, Congrès International d'Histoire comparée V[e] section Paris 1900, 29, pp. 19-22.

*i.e insofar as [what is embraced] is present as true - like; but as does a body [when what is embraced] departs from being even a likeness of truth and falls into confusion»*[40].

For Cusanus the number 1000 constitutes «the derivative» of the number ten which in Greek antiquity attended an almost magic character. Thus, the erudite cardinal followed Philolaus' conceptions i.e. *«one must consider the works and the essence of number according to the power which is in the decad»*[41]. Moreover it might be stressed that according to the source of Aetius, the number ten, which the Pythagoreans considered as the nature of number itself, is thought of as powerful: *«The power, efficacy and essence of number is seen in the Decad; it is great, it realizes all its purposes, and it is the cause of all effects. The power of the Decad is the principle and guide of all life, divine, celestial, or human into which it is insinuated; without it every thing is unlimited, obscure and fictive»*[42].

It is well known that Cusa was an important collector of Greek manuscripts. Nevertheless it is not quite clear if during his visit in Constantinople he acquired Psellus' treatises *On physical number* and *On Ethical and Theological Arithmetic.* During my research regarding Cusa, I found myself to be engaged in the following question. Did he study Psellus' treatises? However the Byzantine erudite in his work *On Ethical and Theological Arithmetic,* revealed the numbers' correspondence to ontological concepts: *«thus of divine number there is a uniform divine principle, prior as cause to the causes in all numbers, a uniform pre-existing even all divine unified number itself. The first then, the one properly speaking, God as we would say, ... and the intelligible and brightest monad ascends to the highest cause; and the supercelestial of the <monad?> leader of (cosmic) order»*[43].

Then practically Psellus (1018-1078) attibuted a divine essence to the monad, while the dyad has also the same character: *«there is a divine dyad, unlimited power... intelligible intellectual, mathematical and in matter»*[44].

In the near future we will attempt to present a comparative study regarding the concept of number in Psellus'and in Cusa's works, in which will be revealed this affinity concerning topics *«for we do not easily accept the contemplation of the unaccustomed and unfamiliar»*[45].

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[40] IDEM, p. 169.
[41] Stobaeus, *Eclogae* I proem. 3.
[42] Aet. 1, 3, 8.
[43] Psellus' On Ethical and Theological Arithmetic in D. J. O'Meara, *Pythagoras Revived.* Clarendon Press Oxford reed. 2006, p. 225.
[44] IDEM.
[45] D. J. O'Meara, *op. cit.,* p. 229.

### *His considerations[46] regarding the universe*

It is also well known that the conception concerning the infinity of the universe arose with the Greeks[47]. Moreover the rediscovery of Lucretius' manuscript of *De rerum natura* in 1417 largely contributed to the development of infinist concepts[48]. However it is not certain that when Cusa wrote *De docta Ignorantia (Learned Ignorantia)* in 1440, was involved in the Lucretian cosmology. Naturally Descartes' affirmation in his letter of the 6th June 1647 to his friend Chanut, constituted a solid reference regarding Cusa's conception on the infinity of the world:

*«the cardinal of Cusa and several other erudites have supposed the world to be infinite, without ever being reproached by the Church; on the contrary, it is believed that to make. His works show how great it is to honor God»[49].*

Nicholas of Cusa *«denies the finitude of the world and its enclosure by the walls of the heavenly spheres»[50].* Nevertheless he does not assert the infinity of the world. The qualification of infinite corresponds only to God. Cusa's universe is not infinite (infinitum) but interminate (interminatum), *«which means not only that it is boundless and it is not terminated by an outside shell, but also that is not «terminated» in its constituents, that is, that it utterly lacks precision and strict determination»[51].*

Nevertheless it might be stressed that Cusa's conceptions regarding the world did not constitute a critisism of contemporany astronomical or cosmological theories and of course did not lead to a scientific revolution[52]. A. Koyré, in his classical treatise, *From the Closed World to the Infinite Universe,* stressed that Cusa not at all constituted a forerunner of Nicholas Copernicus[53], but *«in some of its bold assertions – or negations – it goes far beyond anything that Copernicus ever dared to think of»[54].*

According to Cusa, the universe[55] is an expression necessarily imperfect and inadequate of God. However in his *Learned Ignorantia* he stressed that, *«the universe is a*

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[46] See A. Koyré, *From the Closed World to the Infinite Universe.* Baltimore John Hopkins Press 1957, pp. 17-36. See also *Du monde clos à l'univers infini.* Paris Gallimard 1962.
[47] See f. ex. R. Mondolfo, *L'infinito nel pensiero dei Greci.* Firenze 1934.
[48] E. Cassirer, *The individual and the cosmos in Renaissance philosophy* Trans. M. Domandi New York and London: Harper Torchbooks 1964; E. Grant, *Much ado about nothing. Theories of space and vacuum from the Middle Ages to the scientific revolution.* Cambridge. Cambridge University Press 1981.
[49] René Descartes, Lettre à Chanut 6 Juin 1647 *Oeuvres* éd. Adam - Tannery Vol. V Paris 1903, p. 50.
[50] A. Koyré, *op. cit.,* p. 19.
[51] IDEM.
[52] A. Koyrè, *op. cit.,* p. 20.
[53] IDEM.
[54] IDEM.
[55] E. Hoffmann, Das Universum von Nikolaus von Cues. Cusanus Studien I. *Sitzungsberichte der Heidelberger Akademie der Wissenschaften, Philosophisch-Historische Klasse,* Jahrgang 1929-1930, Abhandlung 3, Heidelberg 1930.

*triunity»,* an a idea which later was adopted by Kepler[56] and he did not hesitate to formulate that: *«if we consider the diverse motions of the* [celestial] *orbits,* [we find that] *it is impossible for the machine of the world to have any fixed and motionless center; but it is this sensible earth, or the air, or fire or anything else. For there can be found not absolute minimum in motion, that is, no fixed center, because the minimum must necessarily coincide with the maximum»[57].* Thus Cusa stated that the centrum of the world coincides with the circumference, so the beginning coincides with the end, i.e. it is nothing else than the Absolute Being or God[58].

To defend his thesis Cusa is ready to reverse the Aristotelian argument, regarding the boundless of the world and declared that: *«the world has no circumference, because if it had a center and a circumference, and thus had a beginning and end in itself, the world would be limited with respect to something else and outside the world there would be something other, and space, things that are wholly lacking truth. Since therefore, it is impossible to enclose the world between a corporeal centrum and a circumference, it is* [impossible for] *our reason to have a full understanding of the world, as it implies the comprehension of God who is the center and the circumference of it»[59].*

Continuing his reasoning, Cusa formulated his views against the Ptolemaic concepts regarding the restless of the earth:

*«The earth, therefore, which cannot be the center, cannot be lacking in all motion... just as the earth is not the center of the world, so the sphere of the fixed stars is not its circumference, ... the earth therefore is not the center, neither of the eighth nor of [any] other sphere, nor does the rising of the six signs [of the Zodiac] above the horizon imply that the earth is in the center of the eighth sphere. For even if it were somewhat distant from the center and outside the axis, which traverses the poles, so that in one part it would be elevated towards one pole, and in the other [part] depressed towards the other, nevertheless it is clear that being at such a great distance from the poles and the horizon being just as vast, men would see only the half of the sphere* [and therefore believe themselves to be in its center]»[60].

The second Book of *De Docta Ignorantia* and especially the first chapter starts with two corollaries preliminary to inferring one infinite universe. Cusanus began this chapter stressing that outside the absolute maximum there can be no equality: *«with regard to things which are comparatively greater and lesser we do not come to a*

[56] A. Koyré, *La Révolution astronomique*. Paris Hermann 1961.
[57] Nicholas of Cusa, *De Docta Ignorantia* lib. II cap. ii. p. 101.
[58] A. Koyré, *op. cit.,* p. 23.
[59] Nicholas of Cusa, *op. cit.*
[60] IDEM.

*maximum in being and in possibility»*[61]. Moreover he stated that there exists no equality of measure and measured: «... *one motion cannot be equal to another; nor can one motion be the measure of another, since, necessarily, the measure and the thing measured differ*»[62].

From this reasoning Cusanus is able to result that there is no precise calculation of the orbits of the planets: «*Although these points will be of use to you regarding, an infinite number of things, nevertheless if you transfer them to astronomy, you will recognize that the art of calculating lacks precision, since it presupposes that the motion of all the other planets can be measured by reference to the motion of the sun. Even the ordering of the heavens – with respect to whatever kind of place or with respect to the risings and settings of the constellations or to the elevation of a pole and to things having to do with these – is not precisely knowable. And since no two places agree precisely in time and setting, it is evident that judgements about the stars are, in their specificity, far from precise»*[63].

Cusanus did not hesitate to declare that the universe is infinite, without boundaries and there is nothing beyond it *«Therefore, only the absolutely Maximum is negatively infinite. Hence, it alone is whatever there can at all possibly be. But since the universe encompasses all the things which are not God, it cannot be negatively infinite, although it is unbounded and thus privatively infinite. And in this respect it is neither finite or infinite. For it cannot be greater than it is»*[64].

In Chapter eleven, Cusa formulated corollaries regarding motion, and he stated that there is no fixed center, and from this it results that there is no circumference. According his doctrine of the coincidence of opposites, Cusanus declared that the center of the world coincides with its circumference and that center is God:

*«However, it is not the case that in any genus - even [the genus] of motion – we come to an unqualified maximum and minimum. Hence, if we consider the various movements of the spheres, [we will see that] it is not possible for the world – machine to have, as a fixed and immovable center, either our perceptible earth or air or fire or any other thing. For, with regard to motion, we do not come to an unqualifiedly minimum – i.e. to a fixed center. For the [unqualifiedly] minimum must coincide with the [unqualifiedly] maximum; therefore, the center of the world coincides with the circumference. Hence, the world does not have a [fixed] circumference... Therefore since it is not possible for the world to be enclosed between a physical center and [a physical] circumference, the world – of which*

61 Nicholas of Cusa, *De Docta Ignorantia* II, 1 p. 58.
62 IDEM.
63 IDEM.
64 Nicholas of Cusa, *op. cit.,* p. 61.

*God is the center and the circumference – is not understood. And although the world is not infinite, it cannot be conceived as finite, because it lacks boundaries within which it is enclosed»*[65].

Thus from this reasoning Cusa could now formulate his revolutionary for that epoch statement: *«Therefore the earth, which cannot be the center, cannot be devoid of all motion... as the earth is not the center of the world, so the sphere of the fixed stars is not its circumference – although when we compare the earth with the sky, the former seems to be nearer to the center, and the latter nearer to the circumference. Therefore, the earth is not the center either of the eighth sphere or of any other sphere»*[66].

## Conclusion

Cusanus was a typical representative of the late medieval epoch, nevertheless in his thought as well as in his works we could recognize a visible cord which relates his christian faith and conviction with Aristotelian and Neoplatonic theories. However as the tireless expert in Cusa's writings, professor Jasper Hopkins stresses that the cardinal *«opens the door to Modernity»*[67], and that indeed characterizes him as a transitional figure from the medieval period to the Renaissance.

[65] IDEM, p. 90.
[66] IDEM.
[67] J. Hopkins, «Nicholas of Cusa (1401-1464): First Modern Philosopher» *Midwest studies in Philosophy* XXVI 2002, p. 29.

# COPERNICUS, THE BIBLE, MATHEMATICS, AND THE POPE

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## Giese's *Hyperaspisticon* and Osiander's letters to Copernicus and Rheticus

In his discussion with Giese, as reported by Johannes Rheticus (1514–1574) in *Narratio prima*, published in Danzig in 1540,[1] Copernicus concentrated on philosophical and astronomical matters. But Copernicus's fears of theological objections were answered by his friend Giese already sometime before 1536, in a now lost treatise entitled *Hyperaspisticon* or *Hyperaspistes (Supershield* or *Shieldbearer*) in which he claimed that Holy Scripture was compatible with heliocentric astronomy.[2]

Another manifest sign of Copernicus's theological concerns can be found in Osiander's correspondence with Copernicus and Rheticus (20 April 1541). As is very well known from his "To the Reader Concerning the Hypotheses of this Work", an anonymous text placed at the beginning of *De revolutionibus* in 1543 without Copernicus's knowledge, Osiander proposed that Copernicus declares his thesis that the earth moves whereas the sun is at rest in the center of the universe to be one of many possible astronomical hypotheses, and an instrument to determine the exact positions of the celestial bodies in the past and to predict them in the future.[3] Osiander maintains that there are different hypotheses regarding the same apparent celestial motion, that these hypotheses are not necessarily true (or do not reflect the actual state of the matter), that they are "appropriate" so long as they yield accurate calculations of

[1] See also, Vesel 2014, 78-81.
[2] See also Lerner 2005, 12; Hooykaas 1984a, 25-26.
[3] On this text and what it means to be an "instrumentalist" or a "realist, see, for instance, Barker and Goldstein 1998.

celestial positions, and that it is possible to invent other, perhaps even better hypotheses.

Two years earlier, in a letter to Copernicus, Osiander explains the same idea, and emphasizes that this is the right way to pacify the peripatetics and the theologians:

"I have always been of the opinion that hypotheses are not articles of faith, but bases for calculation, so that even if they are false it does not matter provided they yield the phenomena of the motions [of the celestial bodies] exactly. For who could make us surer that the unequal motion of the sun is due to an epicycle than that it is due to an eccentric, if we follow Ptolemy's hypotheses, since it could happen in either way. So it would seem to be a good idea for you to say something on this matter in the preface. For thus you would pacify the peripatetics and the theologians whom you fear to be about to raise objections." (Quoted from Jardin 1984, 152; Latin 97)

And in a letter to Rheticus, written on the same day, 20 April 1541, Osiander writes: "The peripatetics and theologians will be easily placated if they hear that there can be diverse hypotheses about the same apparent motion [of the celestial bodies] and that they are not advanced as being certainly so, but rather as governing the calculation of apparent and composite motion as expediently as possible; that it could happen that someone else should think up appropriate constructions and another more appropriate ones, both giving rise to the same appearance of motion; and that anyone is free and, moreover, is to be congratulated if he thinks up more expedient ones. Thus, called away from severity in condemnation and summoned to the pleasures of inquiry, they will at first be more reasonable and then, seeking in vain, will go over to the author's opinion." (Quoted from Jardin 1984a, 153; Latin 98)

## Rheticus's *Cujusdam anonymi epistola de terrae motu*

Rheticus, obviously very much concerned about this matter himself, wrote sometime shortly after 1540 and before September 1541,[4] perhaps as a response to Melanchton's objections,[5] and most likely with the approval of Copernicus and one can speculate that even at his (or even Giese's) instigation, a short treatise on the compatibility of the Holy Scripture and movement of the earth, first published only in 1651 as *Cujusdam anonymi epistola de terrae motu*,[6] in which he, according to Giese's letter to Rheticus of 26 July

[4] Howell 2002, 59, believes it was written between 1541 and 1543.
[5] On this, see Howell 2002, 48-57.
[6] Published in 1651 in Utrecht by Johannes van Waesberge at the end of Davis Gorlaeus's *Idea physica*. Rheticus's text was rediscovered by Hooykaas. See Hooykaas 1984a and 1984b. For a critical edition, see also *Nicolaus Copernicus Gesamtausgabe. Band VIII/1*, 37-73. See also Lerner 2005, 12-13. For a more

1543, showed that the motion of the earth does not contradict the Holy Scriptures. Here is the relevant passage from Giese's letter:

"I want your little work added where you have aptly vindicated the motion of the earth from disagreement with the Holy Scriptures (*a sacrarum scripturarum dissidentia aptissime vindicasti telluris motum*). In this way you will complete the greatness of the well-grounded volume [*De revolutionibus*] and will compensate for what is disagreeable where your teacher [*preceptor tuus*] omitted mentioning you in the preface of the work." (Quoted from Howell 2002, 59; Latin from *Nicolaus Copernicus Gesamtausgabe* VIII/1, 475)[7]

I do not have enough space to present all the historical evidence regarding the authenticity of Rheticus' treatise, but allow me to just remark that besides Giese's above-mentioned letter to Rheticus, and other elements analyzed by Hooykaas (1984a, 17-19; 1984b, 77-78) and Howell (2002, 59), there are also philosophical elements that clearly show that this treatise was written by Rheticus and, what is even more important, that it was very probably written with Copernicus's approval, and must be therefore understood as conforming to his opinions on the interpretation of the Bible and on other important philosophical matters. In short: just like *Narratio prima*,[8] also *Epistola de motu terrae* reveals Copernicus to be a Platonist and is fully concordant with his Platonist orientation traceable in *De revolutionibus*.[9]

In *Narratio prima* Rheticus explains the most fundamental achievement of Copernicus in the Platonist terms of *symmetria* and *harmonia*:

"Moreover, the admirable symmetry and interconnection of the motions and orbs (*orbium symmetria et nexus*), as maintained by the assumption of the foregoing hypotheses, are not unworthy of God's workmanship and not unsuited to these divine bodies." ([1540] 2004, 145; Latin 1982, 59)[10]

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general and systematic treatment on this subject, see Westman 1986, 90, who lists the following four groups of references from the Holy Scripture that are relevant for the theological polemic on Copernicanism: (1) the stability of the earth; (2) the motion of the sun with respect to the terrestrial horizon; (3) the sun at rest; (4) the motion of the earth.

[7] The letter was first published by Jan Brozek in 1615 in Cracow in *Epistolae ad naturam ordinatarum figurarum plenius intelligendarum pertinentes*.

[8] *Narratio prim*a was begun in the library of Frombork in the summer of 1439 and finished in the autumn of the same year. In this text Rheticus quotes or paraphrases Plato on numerous occasions. He quotes from *Republic* 533b–c in Greek and evokes *Timaeus* 40 b-d without mentioning it. He quotes again in Greek from *Epinomis* 990b and paraphrases *Epinomis* 989d–990a in Latin. He refers explicitly to *Georgias* 458a and quotes again in Greek from *Phaedrus* 266b. The last reference is a Latin paraphrase of the explicitly mentioned *Phaedo* 86b-c and 92a–95ª. Rheticus was using Simon Grynaeus' revision of Ficino's translation, which was published in Basel in 1532, but since he also quoted Plato in Greek, he – and Copernicus – apparently also had access to a Greek version of Plato.

[9] See Vesel 2014.

[10] See also Rheticus [1540] 2004, 139; Latin 1982, 56: "Under the commonly accepted principles of astronomy, it could be seen that all the celestial phenomena conform to the mean motion of the sun and that the entire harmony of the celestial motions is established and preserved under its control."

Thus the six movable planetary orbs achieve "celestial harmony (*harmonia celestis*)" ([1540] 2004, 147: Latin 1982, 60),

"[f]or they are all so arranged that no immense interval is left between one and another; and each, geometrically defined, so maintains its position that if you should try to move any one at all from its place, you would thereby disrupt the entire system." ([1540] 2004, 147; Latin 1982, 60)[11]

Rheticus in *Epistola de Terrae motu*, completely in accordance with the Platonist line of *Narratio prima* and *De revolutionibus*, commenting on Proverbs 8, 27-30, ties the motion of the earth around the earth with Plato's demand for *symmetria* and *harmoniae nexus*:

"And I do not see how the wisdom and infinite power of God may so clearly be grasped by the uncomprehending human mind in any [other] part of nature, than it is in accepting the motion of the earth, where it appears that God desired to establish one particular bond of all visible things, something which Plato saw was necessary and urged men to investigate, even though he did not perceive what it really was." (1984a, 75; Latin 49)

But let me return to Rheticus's biblical hermeneutics. Since the content of the *Epistola de terrae motu* is not very well known and since in the space available here it is impossible to summarize it in full, Hooykaas's synopsis should serve as a brief guide. Hooykaas divided the *Epistola de terrae motu* – a title he believes does not sufficiently represent the content and which he therefore translates as *On Holy Scripture and the Motion of the Earth* – into eight units:

(1) Introduction.

(2) No scientific statements in the Holy Scripture.

(3) Scientific data in the Bible? The mobility of the earth in the Bible. Revelations of truths about nature beyond the scope of science.

(4) Holy Scripture on the structure of the sublunary world. The foundations of the earth. The distribution of the land and water on the globe. The firmament.

(5) The new astronomy is physical truth

(6) Texts adduced against the mobility of the earth.

(7) Passages from Scripture about the motion of the sun.

(8) Epilogue.

[11] Compare with Rheticus [1540] 2004, 164-165; Latin 1982, 69: "But if anyone desires to look either to the principal end of astronomy and the order and harmony of the system of the spheres (*systematis orbium rationem ac consensum*) or to ease and elegance and a complete explanation of the causes of the phenomena, by the assumption of no other hypotheses will he demonstrate the apparent motions of the remaining planets more neatly and correctly."

Rheticus's basic teaching on the interpretation of the Bible in matters natural is the Augustinian doctrine of the accommodation.[12] The Holy Scripture is to teach what is necessary for salvation, which means that in scientific matters it should not be taken literally. Instead, one should take into account that it is adapted, accommodated to the understanding of the common people. The principle of accommodation implies that scientific truths are not to be discovered by reading the Bible, including the question of whether the earth moves or not. Despite that, Rheticus delves into Biblical allusions, which, in his opinion, "obscurely" suggest the motions of the earth.[13] According to him (1984, 72-79), the well known verse from Job 9, 6 – "Who moveth the earth from its place, and its pillars are shaken. (*Qui commovet terram de loco suo, et columnae ejus concutiuntur*.)" (1984a, 76; Latin 50) – speaks about the daily and annual motion of the Earth, and Psalms 73, 17, about its third motion, the so-called motion in declination.

On the other hand, he uses the principle of accommodation when he finds statements that seem to support the stability of the earth in Isaiah, Psalms, and Zacharias. Psalms 103 (104), 5, for instance, says:

"Who hast founded the earth on its foundation. It will not be shaken forever. (*Qui fundasti terram super stabilitatem suam, non inclinabitur in saeculum seculi*.)" (1984a, 93; Latin 59)

Rheticus believes that it should not be taken to mean that God created an immobile world and adduces as support mathematics (i.e. astronomy) and other passages in the Bible (1984a, 94; Latin 59). The moon, for example, is evidently unfixed and mobile. If "to found" would mean "to make immobile", then David in Psalms 8 (9), 4 would be affirming that the moon and the rest of the stars are immobile, which is evidently untrue:

"When I see Thy heavens, the works of Thy fingers, the moon and the stars which Thou has founded. (*Quoniam videbo coelos tuos, opera digitorum, lunam et stellas, quae tu fundasti*.)" (1984a, 94; Latin 59)

In this case – if "to found" should be taken as meaning "to make immobile" – the Moon should be immobile, which is obviously not true. This, according to Rheticus, means that God did not make the earth immobile by "fixing" or "establishing" it, for Scripture attributes the same to heaven. The same David says in Psalms 32 (33), 6:

[12] For more a comprehensive interpretation of Rheticus's views, see Hooykaas's notes and commentary in Hooykaas 1984a. For a critical evaluation of some of his views, see Howell 2002, 59- 67. Galileo later adopted the same strategy. See, for instance, Vesel 2015.

[13] See Rheticus 1984a, 79; Latin 52: "These are some passages of Scripture by which we may say that, if the earth moves, something of this, albeit obscurely, is contained in the Bible."

"By the Word of the Lord were the heavens established, and by the Spirit of his mouth was all their strength (ordained). (*Verbo Domini coelis firmati sunt, et spiritu oris ejus omnis virtus eorum*.)" (1984a, 94; Latin 59)

Rheticus reads this and similar claims as meaning that fire, air, water, and earth persist in their place and fulfill the task for which they were created. This means that Psalms 103 (104), 5, speaking about the earth that is founded (fixed and established) on its stability should actually be understood in the sense that it persists forever and that the moon and every other heavenly body is founded and fixed on its stability, from which it will never decline:

"Furthermore, since motion also belongs to the way of being of the earth and of the other moving bodies, *it should be said that each of them has been founded on its stability, that is, so created, that it maintains its established course, (to use a term of Pliny's), and attains its prescribed positions.* […] From all this it is plain that it cannot be proved from the sacred writings that the earth is immobile. Therefore, he who assumes its mobility in order to bring about a reliable calculation of times and motions, is not acting against Holy Scripture." (1984a, 95; Latin 60)

## Tolosani's *Opusculum quartum*

That Copernicus's theological fears and concerns were justified is also evident from the reaction of his very first critic, the Dominican Giovanni Maria Tolosani (ca. 1471–1549), who in 1547 or 1548 authored (but never published) *Opusculum quartum: De coelo supremo immobili et terra infima stabili, ceterisque coelis et elementis intermeddis mobilibus*.[14] Tolosani's strategy is the diametric opposite to that proposed by Rheticus, since he reads and interprets the Bible literally.

The *opusculum* is divided in four chapters. In the first and the second chapter Tolosani exposes Biblical arguments and reasons in favor of the traditional, geocentric cosmology which show why the Copernican heliocentric cosmology is untenable. The last two chapters, the third and the fourth, were added *après coup*, at the demand of his Dominican brothers and are devoted to a more detailed justification of the geocentric cosmos from the physical and astronomical points of view.

In the first chapter of his *opusculum* Tolosani gathers together citations from the Bible that, understood literally, support the stability of the earth at the center of the universe and the immobility of the "supreme heaven" or the empireum. He refers,

[14] As far as I know, there are only two editions of this text. See Garin [1975] 2007 and Lerner 2003. See also Lerner 2005, 14-17. To my knowledge, there is no English translation of this text. On Tolosani, see also Rosen [1981] 2005 and especially Granada 1997.

among others, to Genesis, Isaiah, and Proverbs to show that the supreme heaven is immobile and not the sphere of the fixed stars, and to Psalms 103 (104), 5 and 92, 1, to show that the earth is motionless in the center of the universe; and finally to Ecclesiastes 1, 5–6, in support of the movement of the sun, supporting his interpretation of the Bible with Aristotelian philosophy and (sometimes) with some astronomical basics.

While Rheticus dismissed the literal interpretation of the Bible and showed, as we have seen in his interpretation of Psalms 8 (9), 4; 32 (33), 6; and 103 (104), 5, that interpreting the Bible in geostatic terms leads to contradictions within the biblical text, Tolosani used Psalms 103 (104), 5 – if we focus just on this classical example – as a clear affirmation of a geocentric and geostatic Bible. According to him, the sentence "*Qui fundasti terram super stabilitatem suam; non inclinabitur in saeculum saeculi*" means that God founded and fixed the earth, that is, placed the globe of the earth in a firm manner and immobile in its perpetual stability, in such a manner that it cannot move with any movement whatsoever ([written in 1547 or 1548] 2002, 695). Tolosani supports this interpretation with traditional Aristotelian arguments regarding the gravity of the earth, its natural place, and its state of rest in the middle of the cosmos ([written in 1547 or 1548] 2002, 695).

Copernicus's name only appears in the second chapter, where he is portrayed as a renovator of the Pythagorean doctrine ([written in 1547 or 1548] 2002, 701). Tolosani praises his style and considers him to be "an expert in mathematics and astronomy" ([Written in 1547 or 1548], 2002, 701) but "very deficient in physics and dialectics." ([Written in 1547 or 1548] 2002, 703) Copernicus "seems to be unfamiliar with Holy Scripture since he contradicts some of its principles, not without the risk to himself and to the readers of his book of straying from the faith." ([Written in 1547 or 1548] 2002, 703)

Another important issue raised by Tolosani is the question of the hierarchy of the sciences. According to him, Copernicus denies the first principles of physical and theological sciences. And one does not engage in a disputation with somebody who denies the first principles of the sciences because the first principles are the foundations for the conclusions of the reasoning process and also because the inferior science receives its principles from the superior science. The inferior science therefore depends on the superior one. Astronomy as an inferior science depends on physics, which is superior to it; astronomy presupposes the existence of the natural celestial bodies and their natural movements ([written in 1547 or 1548] 2002, 703). In short, Copernicus cannot be an accomplished astronomer (or an accomplished philosopher) without

knowledge of logic (*dialectica*; the distinction between the true and the false) and without knowledge of the arguments required in the art of medicine, in philosophy, and in theology ([written in 1547 or 1548] 2002, 703).

## Copernicus's *De revolutionibus*

Let us now return to Copernicus. Despite the fact that he was fully aware of the theological implications of his affirmation of the movement of the Earth, he did not address this issue in either his *Commentariolus* (*Little Commentary*) written around 1510, in his *Letter to Werner*, in the original preface or introduction to *De revolutionibus*, or in the main text of this book. The only text where he tackled the problem is "To His Holiness, Pope Paul III, Nicholas Copernicus's Preface to His Books *On the Revolutions*" (hereinafter *Preface*), written in 1542 as a replacement for the original introduction/preface.

## 1. Copernicus writes a new preface

Two years after the spring of 1540, when Bishop Tiedemann Giese, most likely through Rheticus's intervention, persuaded Copernicus to print *De revolutionibus*, at the time when the manuscript was already in the hands of the printer Petreius in Nuremberg, Copernicus decided that he had yet to find a powerful patron to protect him from the attacks that he anticipated from all directions. At the last moment, in June 1542, he dedicated *De revolutionibus* to Pope Paul III, composing the dedication "To His Holiness, Pope Paul III, Nicolaus Copernicus' Preface to his Books *On the Revolutions*".

Why did Copernicus do this? Why did he replace one text with another? According to Barker and Goldstein (2003), Rheticus created expectations that Copernicus's book would be dedicated to the Duke of Prussia, but having consulted Bishop Giese, he changed his mind and at the last moment decided to dedicate *De revolutionibus* to Pope Paul III.[15] Granada and Tessicini (2005) on the other hand, argued that Copernicus changed his mind because he received news that Girolamo Fracastoro had dedicated to the same Pope an alternative and competing proposal for astronomical reform in his *Homocentrica*. I find Granada's and Tessicini's argumentation very plausible but nevertheless believe that this fact does not exhaust *all* the reasons for Copernicus's change of plan. My thesis is that Copernicus increasingly realized that his affirmation of the motion of the Earth was so problematic, so new and absurd (as he himself characterized it) that it contradicted not only the established tenets of astronomy, but

[15] For a different opinion, see Goddu 2010, 293-294.

also the established tenets of natural philosophy and theology – and therefore it needed some advance defense. In my opinion, this is the general and strategic reason for his last-moment decision. There is abundant evidence supporting this, one need just to take a close look at his argumentation in the *Preface.*

In the *Preface* to *De revolutionibus*, Copernicus gathers together all categories of the most likely opponents to the earth's motion that appeared in his previous texts and Osiander's letters. The thesis of the earth's motion contravenes the established and accepted *scientia* and, as Copernicus explains a few paragraphs further, is aimed against the "traditional opinion of mathematicians" ([1543] 1992, 4), that is, astronomers who have, of course, espoused peripatetic cosmology with the motionless earth at the center of the universe. It is also *contra communem sensum,* against common sensory experience or against widely held opinion, i.e. common sense, in its modern connotation, as *sensus communis* could also be interpreted.[16] It also challenges certain passages of Holy Scripture as the divine word of truth. Copernicus nowhere mentions any specific theological objection to the movement of the earth, but simply says that there might be babblers (*matailogoi*) who will, "badly distorting some passage of the Scripture to their purpose, [...] dare to find fault with my undertaking and censure it." ([1543] 1992, 5) All possible opponents and scoffers of the earth's motion may thus be divided into three categories: theologians, peripatetic philosophers, whose physics is also accepted by mathematicians (i.e. astronomers), and the proponents of sensory experience or common sense. These categories coincide with three types of arguments against the motion of the earth: philosophical, experiential, and theological. Copernicus's central thesis that the earth moves is therefore extremely problematic. It goes beyond the normal, approved state of existing articulations of knowledge: the *sensus communis*, Aristotelian natural philosophy, and the *regina scientiarum* – the "queen of knowledge", the "queen of sciences" – i.e. theology. This, in turn, means that the concept of the earth's motion reaches beyond the boundaries of the particular, astronomical, or mathematical discourse in which it was generated, and becomes subject to both "learned" or "educated" (philosophy, theology) belief, and "non-learned" or "non-educated" (general or popular) belief. Copernicus is thus pushed into a corner.

What can he do? How can he introduce the earth's motion into astronomy without being ridiculed or even condemned?

Finding Osiander's proposal unacceptable, Copernicus is compelled to show that the earth's motion has a sound mathematical or astronomical basis (Chapters 9 and 10

[16] Copernicus obviously has in mind the Aristotelian psychological concept.

of Book I of *De revolutionibus*),[17] that the existing philosophical and experiential arguments against its motion do not contribute to a critical debate, and that there is a consistent alternative physics that can provide answers to both kinds of objections. This he achieves – or at least so he thinks – in Chapter 8 of Book I of *De revolutionibus*.[18] But this alone does not suffice.

In the *Preface* he reveals the intrinsic, substantial reasons due to which he turned for help and protection to the highest authority (at least symbolically) of the time. Copernicus develops an extremely interesting defensive strategy to introduce the concept of the earth's motion into astronomical *scientia* and simultaneously to reveal to a careful reader several deeper motives for addressing the Pope.

Copernicus's thesis that the earth moves whereas the sun is at rest at the center of the universe, is – this is the impression Copernicus wants to create – a response to a critical state in astronomical *scientia*. But his scholarly response, the argument that the earth moves, has been so far dismissed as utterly absurd and inconceivable by all long-established and approved articulations of knowledge, his proposal is even more problematic than the state of astronomy itself. The sheer universality of the thesis, which was generated within a particular *scientia* but transcended the boundaries and norms of the approved knowledge, compels Copernicus to step out of the learned discourse, if only for a moment, if he wants to succeed in defending his inherently scholarly solution to the astronomical problems. Given that the concept of the earth's motion is in conflict with established astronomy and philosophy, popular belief, and approved theology and regarded by all as absurd and inconceivable, Copernicus must justify his concept before the universal court of all articulations of knowledge, learned and unlearned, scholarly and non-scholarly alike. In other words: the introduction of an absurd and inconceivable concept of the earth's motion into *scientia* is first a matter of the politics of scholarly investigation, and only then a matter of scholarship.

Copernicus's decision to replace the original preface with a new one should therefore be recognized as the fruit of his profound realization that scholarship alone cannot provide a sufficient basis for the introduction of the concept of the earth's motion into scholarly discourse, that there certainly is some politics of scholarship that is not controlled by scholarly endeavor itself but by the Church and ultimately the Pope as its symbolic representative.

[17] See Vesel 2014, 207-235.
[18] See Vesel 2014, 155-205.

## 2. Copernicus's argument in the *Preface*

What is, then, Copernicus's strategy? How, in his mind, is the introduction of the earth's motion into astronomy legitimized? How does he respond to the anticipated objections of *sensus communis*, the peripatetics, and theologians?

Let me outline his argument in the *Preface*. From the first sentence of the *Preface* Copernicus presents the earth's motion as utterly problematic. Therefore Copernicus finds himself in quite a predicament. The motion of the earth is widely held as completely absurd and inconceivable. Hence, the concept of the earth's motion is subjected to criticism that does not understand it and dismisses it, without even trying to understand what it means.[19] He has two options to avoid scorn and condemnation: reserve the learned thesis for circle of select colleagues (i.e. spread it "not by writing but by word of mouth"), or seek refuge in radical silence, complete secrecy, and abandon work altogether. "When I weighed these considerations," he writes, "the scorn which I had reason to fear on account of the novelty and absurdity of my opinion almost induced me to abandon completely the work which I had undertaken." (Copernicus, *On the Revolutions*, 3)

Obviously Copernicus does nothing of the sort. Why? Why does he decide to spread his doctrine on the motion of the earth not only by word of mouth but in writing, despite the scorn he expects to receive from the *vulgus*? He cites two important reasons which compelled him to publish the volume, despite the novelty and absurdity of his opinion on the earth's motion: first, the encouragement of his friends, and second, the scientific imperative.

Copernicus mentions the support and encouragement of Bishop Giese and Cardinal Nicholas Schönberg (1472–1537), in particular to impress the Pope.

Schönberg, elevated to cardinal by Pope III himself, was one of the main political players during a time of difficult relations between the Church and the Empire throughout the 1520s and 1530s.[20] He was informed of Copernicus's work on heliocentric astronomy by his secretary Johann Albrecht Widmanstetter (1506–1577), who might even have drafted Schönberg's letter to Copernicus, signed on 1 November 1536, asking him to communicate his discovery to scholars and to send him his writings. Later on in the *Preface*, Copernicus describes his friends and supporters as eminent authorities in science. He characterizes Cardinal Schönberg as "renowned in every field of learning" ([1543] 1992, 3) and Bishop Giese as "a close student of sacred letters and

[19] See also Szczeciniarz 1998, 38-39. I agree with many points of his analysis of the *Preface*.
[20] See Granada and Tessicini 2005, 442.

of all good literature." ([1543] 1992, 3)[21] In this formulation, Copernicus's rhetorical exhortation and the encouragement of his friends can also be understood as his construction of a public different from the public that agrees with the consensus of many centuries as to the absurdity of the earth's motion, and, in advance, ridicules, rejects, and condemns such a thesis. So, there is, after all, a public, a learned community that does not regard the concept of the earth's motion as ridiculous; just the opposite. The existence of such a scholarly environment implies that allowing a learned thesis to address it has far more beneficial effects on learning than leaving it unpublished.[22] Copernicus references, in addition to Schönberg and Giese, a few other very eminent scholars who exhorted him "no longer to refuse, on account of the fear which I felt, to make my work available for the general use of students of mathematics." ([1543] 1992, 3) "My explanations," "my writings," writes Copernicus, can dispel the apparent initial absurdities if we delve deep enough into their arguments and demonstrations:

"The more absurd my doctrine of the earth's motion now appeared to most people, the argument ran, so much the more admiration and thanks would it gain after they saw the publication of my writings dispel the fog of absurdity by most luminous demonstrations." ([1543] 1992, 3)

Influenced therefore by "these persuasive men and by this hope, in the end I allowed my friends to bring out an edition of the volume, as they had long besought me to do." ([1543] 1992, 3)

But what leads Copernicus to start contemplating the earth's motion in the first place? Why does he venture "to conceive any motion of the earth against the traditional opinion of mathematicians and almost against common sense"? ([1543] 1992, 4)

Copernicus is compelled to consider a different system of deducing the motions of the universe's orbs by the realization that astronomers do not agree among themselves in their investigations. They are not certain about the motion of the sun and the moon and do not use the same principles, assumptions, and explanations of the apparent revolutions and motions. Nor do they produce fully adequate astronomical theories: the

[21] The mention of Bishop Tiedemann Giese, Copernicus's long-standing friend, and particularly Cardinal Schönberg, who was made cardinal by Paul III himself, as well as the fact that Copernicus published Schönberg's letter at the beginning of *De revolutionibus,* are also significant for yet another reason. In this manner Copernicus tried to bridge the abyss between him "living in this very remote corner of the earth" ([1543] 1992, 5) and the courtly audience. Moreover, the Cardinal's praise of Copernicus in his letter and his description of Copernicus's system gave the impression of high probability. On this, see Granada and Tessicini 2005, 441-447. See also Rheticus's description ([1540] 2007, 195; Latin 86) of Tiedemann Giese as a scholar in *Narratio prima*: "In addition, the benevolent prelate deeply loves these studies and cultivates them earnestly. He owns a bronze armillary sphere for observing equinoxes, like the two somewhat larger ones which Ptolemy says were at Alexandria and which learned men from everywhere in Greece came to see. He has also arranged that a gnomon truly worthy of a prince should be brought to him from England. I have examined this instrument with the greatest pleasure, for it was made by an excellent workman who knew his mathematics." I owe this point to Peter Barker.

[22] See also Szczeciniarz 1998, 40.

proponents of the homocentric model are unable to deliver accurate calculations of the positions of the celestial bodies, whereas the proponents of eccentrics and epicycles seem to have solved this problem to a considerable measure, but only by contradicting the first principles of uniform motion. Moreover, astronomers are unable to

"elicit or deduce the principal consideration, that is, the structure of the universe and the certain *symmetria* of its parts." ([1543] 1992, 4)

In other words, they are unable to arrive at any certain conclusions. Copernicus confronts this uncertainty in explaining the motions of the spheres of the *machina mundi* with cognitive optimism stemming from his realization that the *forma mundi* was created "for our sake by the best and the most regular Artisan of all" ([1543] 1992, 4), that is, God.

The world as God's creation should itself be perfect, regular, orderly and, having been made for our sake, also cognizable. This readability of the world is the reason for which he claims to have undertaken

"the task of rereading the works of all philosophers which [he] could obtain to learn whether anyone had ever proposed other motions of the universe's spheres than those expounded by the teachers of mathematics in the schools." ([1543] 1992, 4)

Copernicus lists Cicero and Pseudo-Plutarch, who invoked several defenders of the motion of the earth: Hicetas of Syracuse, Philolaus of Croton (Philolaus the Pythagorean), Heraclides of Pontus, and Ecphantus the Pythagorean.

References to ancient proponents of the earth's motion are an extremely telling component of Copernicus's strategy. In the hope that the Pope and humanist clergy would approve his astronomical system as congruent with the principles of Renaissance and humanist culture, he does not present it as a novelty but embellishes it with the authority of a venerable, time-honored tradition. He maintains that the earth's motion is "novel and absurd" only in the eyes of the uninstructed, who rely more on their senses than reason and who are not competent to pass judgment on philosophical matters. The earth's motion is, in fact, an age-old doctrine, so old as to have been debated even long before the days of Aristotle.

## 3. Theological concerns and hopes: the Pope as mathematician/astronomer

Copernicus introduces the concept of the earth's motion into astronomy on the basis of the legitimacy assigned to it by antiquity, which shed a new light on "the consensus of many centuries" (and people). He realizes that the concept contributes not only to "saving the phenomena" but also to deducing the constitution of the universe, which he

explains in his book. The latter is, in Copernicus's construction of events in the *Preface*, thus written and published. What follows next? That which he fears the most and tries to avoid for so long before he finally decides to print his manuscript? Will his work meet with ridicule or even condemnation? What does fate have in store for Copernicus's book and theory?

Copernicus has no doubt that the arguments in his book are sufficiently sound to satisfy the learned community for which they are primarily intended. However, rather than referring to the scholarly community in general, he focuses on the circle of mathematicians, that is astronomers, convinced that his demonstrations will persuade "acute and learned mathematicians." ([1543] 1992, 5). In his opinion, judgment as to whether the concept of the earth's motion is appropriate rests in the hands of astronomers, who will surely agree with him if,

"as this philosophy especially requires, they are willing to examine and consider, not superficially but thoroughly, what I adduce in this volume in demonstration of these matters." ([1543] 1992, 5)

Copernicus thus no longer fears that acute and learned mathematicians will condemn the thesis of the earth's motion and oppose it, insofar as they thoroughly examine his theory. On the contrary, as seen earlier, he firmly believes that he will even be able to persuade them to espouse his viewpoint, and that after careful consideration of the arguments they will find that the apparently absurd thesis is, in fact, worthy of admiration, and will agree with him. "Acute and learned mathematicians" will eventually advocate precisely what appears to be "against the traditional opinion of mathematicians." In other words: Copernicus firmly believes in the persuasive power of mathematical discourse among mathematicians.

However, while Copernicus has no doubt about the favorable reception of the thesis of the earth's motion among "acute and learned mathematicians" and its contribution to astronomy, there is still one other community of learned men in which his success is far from guaranteed, i.e. theologians or, rather, theology as a strain of *scientia* based on the word of God. However, he does not refer to all theologians, but only to those who are ignorant and uninstructed in mathematics, but nevertheless dare to pass judgment on the subject following God's word in the Scripture:

"Perhaps there will be *mataiologoi* [babblers or prattlers] who claim to be judges of mathematics although completely ignorant of the subject and, badly distorting some passage of Scripture to their purpose, will dare to find fault with my undertaking and

censure it. I disregard them even to the extent of despising their criticism as unfounded." ([1543] 1992, 5)[23]

"Mathematics", maintains Copernicus, "is written for mathematicians" ([1543] 1992, 5): *mathemata mathematicis scribuntur*.

Thus, Copernicus gradually shows his hand to the Pope and other readers in the *Preface*. The initial apprehension that his concept of the earth's motion will earn nothing but scorn, rejection, and condemnation from "[t]hose who know that the consensus of many centuries has sanctioned the conception that the earth remains at rest in the middle of the heaven as its center" ([1543] 1992, 3), ultimately turns into fear of being mocked by theologians and their "distorted" passages from the Holy Scripture. Acute and learned mathematicians and ordinary persons, advocates of *sensus communis*, completely disappear from Copernicus's horizon of potential opponents and "schemers" calling for the condemnation of his theory. Why?

The first, "acute and learned mathematicians", disappear because they will agree with him after they examine his work and its mathematical demonstrations, whereas "ordinary persons" are of no consequence to him at all. The fundamental problem facing Copernicus is the reception of his thesis of the earth's motion, which although widely regarded as "novel and unconventional", is, in fact, old. The state of scholarship, religion, and general opinion renders its acceptance impossible and allows it no room to spread. Even less does it grant Copernicus the opportunity to present it appropriately, articulate the mode of its promulgation, or have control over the manner of its reception. Because the destiny of his work depends first on external elements, Copernicus has to garner the support of the factors that control the situation. These, however, are not "ordinary persons", representatives of the *sensus communis*, figuratively speaking, but the Church as the ultimate authority with the Pope as its supreme leader and symbolic representative. From this perspective, Copernicus can simply dismiss the reaction of "ordinary persons" as inconsequential. What is relevant is not the reception among the uneducated, but among the educated. Certain of a favorable reception among learned mathematicians, he is now primarily concerned with how the thesis will be received among theologians. This is so much truer, as it is theology and theologians who, in fact, control the politics of scholarship. In short, Copernicus knows that the destiny of scholarship depends not (only) on scholarship itself but on some politics of scholarship that is ultimately controlled by the Church, especially when it involves the introduction

[23] On the use of the term *matailogoi* in Copernicus's days, see also Hallyn [1987] 1993, 65–67, and Lerner 2005, 28, n. 15: "The Greek word *matailogoi* (rendered by the Vulgate as *vaniloqui*) and here by 'prattlers' is a rare word that Copernicus probably took from the New Testament, Titus 1: 10, where St. Paul denounces false doctors."

of what many see as the complete "novelty and unconventionality of his opinion", i.e. that the earth moves. Therefore, he is left with no other option but to find allies within the Church who will concur with him, and to discredit *in advance* anyone who rejects, ridicules, or condemns his thesis of the earth's motion due to theological or biblical considerations.

This is why Copernicus turns to Pope Paul III as an authority that, metaphorically speaking, stands outside the frameworks of Copernicus's time, an authority that can pass judgment unburdened by the existing forms of knowledge. Copernicus places the Pope beyond "the traditional opinion of mathematicians" and "common sense". He releases him from the standard, approved science, universal understanding, common sense, and places him in a position in which the Pope can freely assess what ordinary persons deem a "novel and unconventional thesis" and use his authority to protect the thesis from "calumnious attacks":

"However, in order that the educated and uneducated alike may see that I do not run away from the judgment of anybody at all, I have preferred dedicating my studies to Your Holiness rather than to anyone else. For even in this very remote comer of the earth where I live you are considered the highest authority by virtue of the loftiness of your office and your love for all literature and mathematics too. Hence by your prestige and judgment you can easily suppress calumnious attacks although, as the proverb has it, there is no remedy for a backbite." ([1543] 1992, 5)

The Pope can use his symbolic and real power, which is at once theoretical, political, and social, to protect the seemingly absurd thesis of the earth's motion from being condemned and dismissed *in advance*. Copernicus deems the representative of religious orthodoxy adequately well versed in "all literature and astronomy" ([1543] 1992, 5), so that he, along with other "acute and learned 'mathematicians'", will agree with his thesis of the earth's motion, protect it from "calumnious attacks", and prepare the ground for it to spread.

In the *Preface* Copernicus puts into the category of "acute and learned mathematicians" within the Church also Pope Leo X, Cardinal Schönberg, Bishop Giese, and Paul of Middelburg (Bishop of Fossombrone). As for the other category, those who, "although completely ignorant of the subject [...], would dare to find fault with my undertaking and censure it," ([1543] 1992, 5) it only includes the church father Lactantius. The choice is not accidental. Lactantius, "otherwise an illustrious writer but hardly a mathematician" ([1543] 1992, 5), "speaks quite childishly about the earth's shape" ([1543] 1992, 5) in his *De divinis institutionibus* III, 24, "when he mocks those who declared that the earth has the form of a globe" ([1543] 1992, 5). Much like

Lactantius, a theologian completely ignorant in mathematics, talks foolishly about the shape of the earth and mocks those who pronounced it to be spherical, there are perhaps also contemporary non-mathematicians who will ridicule Copernicus's thesis that the earth moves. Just like Lactantius scorns the fundamental assumption of astronomy, namely that the earth is a sphere, a thesis that lies at the very foundation of mathematical astronomy, which has been validated by the "traditional opinion of mathematicians", there may also be *matailogoi* within the Church who will, although completely ignorant of the subject, "badly [distort] some passage of Scripture to their purpose" ([1543] 1992, 5), and ridicule the fundamental postulate of Copernicus's astronomy, i.e. that the earth moves.

The only branch of learning that has the legitimate right to pass judgment on the concept of the earth's motion is mathematics, i.e. astronomy: "Mathematics is written for mathematicians." This maxim, when transposed to the domain of the existing articulations of knowledge, that is, theology, mathematics, and general opinion as a potential arbiter of the earth's motion, excludes *sensus communis* and divides theology into two camps: one that judges mathematical matters by relying on mathematics, and one that is devoid of any knowledge regarding mathematics but nevertheless dares to sit in judgment on mathematical matters (*mathemata*) by drawing on theology. Copernicus expects theologians who are well versed in mathematics to understand his demonstrations and support his thesis of a movable earth (or at least not refute it). But he also expects opposition and censorship from those who are completely ignorant of the subject and invoke certain passages of the Holy Scripture that could be interpreted in favor of the earth's immobility.

Considering all of the above, the assertion *mathemata mathematicis scribuntur* ultimately means that matters of astronomy can, according to Copernicus, be decided on by astronomy alone. But that is not enough in this situation. Since mathematics and mathematicians have no say in the politics of scholarship, which rests in the hands of the Church, they have no control over the reception of their theses. The only legitimate solution for Copernicus's theory to survive is, then, to commit "matters of mathematics" to the judgment of men within the Church who are competent in the subject. Therefore, in discussing matters of mathematics even the Church itself, or the theological articulation of knowledge, which relies on the word of God, must subject itself to mathematics and not vice versa. When dealing with astronomical questions, astronomy must hold authority over the interpretation of the Scripture rather than the Scripture holding authority over the interpretation of astronomy. With this thesis Copernicus effectively refutes all particular theological objections to the motion of the earth based

on Biblical citations, and unequivocally strips theology of the authority to pass judgment on scientific questions "inside its own ambit and challenges its status as the queen of the sciences." (Granada and Tessicini, 457)

The last group that Copernicus addresses is that of the mathematicians within the Church. They will realize that the concept of the earth's motion will only be ridiculed by non-mathematicians and conclude that his thesis not only does not contradict Holy Scripture but contributes to the Church by bringing practical solutions to the ongoing calendar reform:

"Mathematics is written for mathematicians. To them my work too will seem, unless I am mistaken, to make some contribution also to the Church, at the head of which Your Holiness now stands. For not so long ago under Leo X the Lateran Council considered the problem of reforming the ecclesiastical calendar. The issue remained undecided then only because the lengths of the year and month and the motions of the sun and moon were regarded as not yet adequately measured." ([1543] 1992, 5-6)[24]

## Conclusion

To recapitulate: a scholarly response to the "critical" situation of science requires some external justification. Copernicus, indeed, turns to Pope Paul III. The situation, which is unfavorable to his geokinetic and heliocentric reform of astronomy, has to be changed into a situation that will allow room for the introduction of the "novel and unconventional" concept of the earth's motion into *scientia*. This, however, will only be feasible if the concept is also endorsed by the Church – the authority that controls the political situation, including that of learning. Nevertheless, Copernicus only seems to step out of scholarly discourse by providing an external justification, but this stepping out brings him back to the domain of scholarship. His reaction to the critical situation of astronomical *scientia* is a formulation of relations that are or ought to be established between scholarship and the extra-scholarly field (the general opinion or "ordinary persons"), as well as a formulation of relations within the learned discourse itself (mathematics–philosophy–theology). These are, as he maintains in the *Preface,* inevitably such that the concept of the earth's motion, which is – at least in his view – inherent to astronomy, must be placed under the authority of the learned discourse which has generated it, i.e. mathematics: "mathematics is written for mathematicians." His tying the concept to the Pope's (or the Church's) support is therefore only apparent. The Pope (along with other theologians and the Church, respectively) as the

[24] On the calendar reform within the context of the *Preface*, see Granada and Tessicini 2005, 464-470.

representative of the authority that controls the politics of scholarship is left with no alternative: if he is a true mathematician, he will, like all other "acute and learned mathematicians", agree with his concept of the earth's motion, once he has examined the arguments. If not, he has no right to sit in judgment on matters written for mathematicians.

An external authority is only allowed to sit in judgment on Copernicus's learned answer to this critical situation in learned discourse insofar as he is learned himself, i.e. insofar as he does not transcend the boundaries of the learned discourse within which the concept under examination has been developed. In such case, however, that particular scholarship alone must be strong enough to convince the authority that controls the politics of scholarship of the legitimacy, validity, and truthfulness of the new concept. Although Copernicus may give the impression of subordinating science to the Church, exactly the opposite is taking place: the Church (the Pope, theology) must be subordinate to the learned discourse whose politics it controls. Hence, although *scientia*, which transcends the established general norms, has to acquire approval from the authority that controls the politics of scholarship, the latter can only do so by subordinating itself to scholarship. The mid-point between the thesis that "mathematics is written for mathematicians" and the thesis that the politics of scholarship is controlled by the Church rather than mathematicians is that the introduction of the concept of the earth's motion into the learned discourse somehow rests in the hands of the Pope as the supreme mathematician.

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# RELIGION, SCIENCE AND THE REJECTION OF SPIRITUAL ENTITIES IN 17TH CENTURY

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## Spiritual entities

From the ancient times various spiritual (or quasi-spiritual) entities possessed an important place in philosophical or scientific theories on the nature and function, particularly – but not only – of living beings. Generally speaking, these entities act as: 'governors', 'organizers', 'form-givers', 'life-givers', 'transformers' or 'movers'. In a notable sense, they are connected to final causes.

Some of their main characteristics can be already traced at their earlier appearance in relevant texts. So when Arostotle, in his *De generatione animalium*. speaks of the semen and its capacity to produce new life:

Now it is true that the faculty of all kinds of soul seems to have a connection with a matter different from and more divine than the so-called elements; but as one soul differs from another in honour and dishonour, so differs also the nature of the corresponding matter. All have in their semen that which causes it to be productive; I mean what is called vital heat. This is not fire nor any such force, but it is the spiritus included in the semen and the foam-like, and the natural principle in the spiritus, being analogous to the element of the stars. (Aristotle, II, 3)

To note here are designations like “matter different from the elements”, “more divine”, “analogous to the element of the stars”1. Such characteristices we shall encounter through the whole history of these entities.

In the ancient literature we meet such entities in the names: 'Nature' (*φύσις*),

[1] i.e. the *πέμπτη οὐσία* of Aristotle

'Anima mundi' etc. In the medical literature we meet again and again, unter various erxpressions the 'Vis nedicatrix naturae'[2]

With the Galenists we have the three kinds of spirits: *natural spirit* in the liver and the venous blood, *vital spirit* in the left ventricle of the heart and the arterial blood, *animal spirit* in the brain and the nerves. In a certain sense, the three kinds of spirits are, respectively, organs of the three parts of the soul in the Platonic sense (appetitive, spirited, logical), in that ascending order. Natural and vital spirits come with the blood to the various organs and ensure their sustenance and vital functions. Animal spirit comes, with the nerves, on the one hand to the sense organs and enables them to be sensitive, on the other hand to the muscles enabling them to contract and execute various movements.[3]

In the Renaissance the presence and importance of such entities becomes more prominent. Intresting is the case of Jean Fernel (1497-1558), a famous French physician, a reformer of Galenic medicine. In his book *Medicina*, appearing in1554, he writes regarding the spirits:

The Academics4 were the first to suppose, when they realized that two entirely dissimilar natures cannot be associated together without the interposition of a suitable mean, that our soul, created by the supreme maker of all things, before its emanation and immigration into this thick and solid body, put on as a single garment a certain shining, pure body like a star, which, being immortal and eternal, could never be detached nor torn away from the soul, and without which the soul could not become an inhabitant of the world. Then they surrounded the soul with another body, also fine and simple, but less pure, less shining and splendid than the first, not created by the supreme maker, but compounded of a mixture of the finer elements, whence it is named aerial and aethereal. Clothed with these two bodies the soul, entering this frail and mortal body, or rather thrown like an exile into a loathsome and shadowy prison, becomes a guest of the earth until, having broken from this prison and having returned, joyful and free, to its home, it is made a fellow-citizen of the gods.5

Here the intermediate position of spirit between soul and the body (or the material world) is clearly shown. Another of Fernel's books, *De abditis rerun causis* (*On the Hidden Causes of Things*, 1548) is written in a form of a dialogue; here the physician

[2] According to one Hippocratic writer "The body's nature is the physician in disease" (Hippocrates, 255). Well known from the Latin literture is the saying: "Medicus curat, natura sanat".
[3] It must be noted that Galen does not deal explictly with the natural spirit; he only mentions somewhre that, if it exists, it must be located in the liver. But the three of them are constantly present with later (especially Medieval) Galenists.
[4] i.e. the Neoplatonists
[5] Quoted in: Walker, 119

Eudoxus represents Fernel's own opinion. In the following quotations subject of the conversation are the so-called 'natural faculties', which play a significant role in Galen's physiology. Such faculties are e.g. the 'digestive' faculties in the stomach, or the 'attractive' faculty that enables an organ to draw to itself from the blood those 'constituents' that are appropriate and necessary for its nutrition and function.

[Eudoxus] For there is no temperament of elements that can be the cause of the stomach's tight grasp of the food, retaining it till it is fully concocted, and expelling it as soon as it has become concocted and reduced. [ ... ] For these functions are the work of some power more pre-eminent and divine than the elements, one implanted in individual parts from their ultimate origin.

[ … ] However, when something performs an attraction, not of [just] anything but of something congenial, it does it not by heat alone, but by another more pre-eminent faculty. [ ... ] Will the heat of an element distinguish on its own what is beneficial, so as to attract it alone, but detect harmful cold as to be repelled? (Fernel, 501-503)

Fernel connects these faculties to 'divine' powers, powers that are beyond the realm of the four elements, related to the heavenly regions. In another place, he even ascribes the pre-eminence of these faculties to the actual presence of God in the parts of the body:

[Eudoxus] [According to Galen] he who shaped our body, whoever he has been (he [Galen] declares that this is the celestial mind, and sometimes too that it is God), still stays in the shaped parts and is now making use of the individual ones – is this not the very view that Plato made a household word everywhere, that God is the crafting and ruling cause of ourselves? (Fernel, 471)

With Paracelsus (1493-1541) we have an extensive presence and dominance of spiritual entities everywhere. As an example, the digestive faculty of the Galenists becomes almost personified as an 'alchemist' (or 'archeus') acting in his laboratory and performing various complex processes.

A person eating meat, wherein both poison and nourishment are contained, deems everything good while he eats. For, the poison lies hidden among the good and there is nothing good among the poison. When thus the food, that is to say the meat, reaches the stomach, the alchemist is ready and eliminates that which is not conductive to the well-being of the body. This the alchemist conveys to a special place, and the good where it belongs. This is as the Creator ordained it. In this manner the body is taken care of so that no harm will befall it from the poison which it takes in by eating, the poison being eliminated from the body by the alchemist without man's cooperation. Of such a nature are thus virtue and power of the alchemist in man. (Leidecker, 29)

But not only that. For Paracelsus, diseases are produced by spiritual entities,

medicaments act because of spiritual entities residing in them etc. A similar picture offer us the views of Joan Baptista van Helmont (1579-1644). According to him (as rendered by Walter Pagel):

Each object contains its own spirit and there are as many spirits as there are bodies and objects: there are spirits celestial, infernal, human, metal, mineral and salt, spirits in germs, marcasites, arsenicals, potables, aromatica, herbs, roots and wood, in flesh, blood, bones, and so on. It is these spirits that, as Paracelsus sees it, give life to all things – life that is a "spiritual, invisible and incomprehensible thing, a spirit and a spiritual thing." Hence, everything is alive and "what is life other than a spiritual thing?" (Pagel, 66)

Van Helmont describes a host of spirits governing the formation and functions of organs and members of the human body:

There is then, first the archeus, the organizer that is concerned with the designing of individual organs and members. He particularizes his "monarchy" in accordance with the local requirements of each of them. He establishes for each part a "stomach" or "kitchen", entrusted with the reception and preparation of the nourishment carried to the member by the blood. He appoints the "particular pilots of the members" – the subarchei, specialized in their tasks and limited by the requirements and boundaries of individual members. By contrast the "master" who appointed them is a central authority; he remains as "internal president, curator and rector", an organismic archeus "floating about", "full of light" and never at rest. Obviously the archeus influens surpasses in potency and spirituality the subordinate *archei insiti*. These are "fixed" to their places, comparably to fixed matter and in contrast to its volatile counterpart which is "male", active, "alive" and freely moving. (Pagel, 98)

Van Helmont's views on the ubiquity of spirits are particularly interesting, since they were formulated at the same time mechanical philosophy began to flourish, i.e. the very philosophy that rejected spiritual entities and did not acknowledge to them any role for the natural processes.

## The mechanical philosophy

Mechanical philosophy, which became prominent during the 17th century, was characterized by a) a revival of the ancient atomic theory, b) the view that nature, organisms etc. function as machines. Of course, there were different varieties of the mechanical philosophy.

A prominent exponent of atomic theory was **Pierre Gassendi** (1592-1655), a French catholic priest. In his work *Philosophiae Epicuri Syntagma* (1649) he undertakes

a revival of (Epicurean) atomic theory. This is quite strange, since Epicureans were regarded as atheists. But he tries to reconcile such views with Christian faith by pointing out that (a) God imposed motion on atoms at the creation of the world, and that (b) the order and harmony of the universe demonstrate God's existence and his attributes of goodness and providence. Furthermore, since an infinite number of atoms was incompatible with the idea of a provident God, he postulated that the universe of atoms is finite. (Ashworth, 141-142)

A follower of Gassendi in England was **Walter Charleton** (1620-1707), a physician to King Charles of England, a pious Christian (Anglican). His main works: *The Darkness of Atheism Refuted by the Light of Nature* (1652) and *Physiologia Epicuro-Gassendo-Charltoniana; or, A Fabrick of Science-Natural upon the Hypothesis of Atoms* (1654). In his own words:

To a sober judgment it appears the highest *impossibility* imaginable, that either the Chaos of Atoms could be eternal, self-principate, or increate, or dispose and fix itself into so vast, so splendid, so symmetrical, so universally harmonical, so Analogical a structure as this of the World. For, as the Disposition of the Chaos of Atoms into so excellent a form, can be ascribed to no other Cause, but an *infinite Wisdom*, so neither can the *Production* or Creation of the same Chaos be ascribed to any other Cause, but an *infinite Power*, as we have formerly demonstrated in our *Darkness of Atheism*, cap. 2.6

*It may appear as a surprise that religion endorses such a mechanistic and extremely materialistic picture of the world. But the connections between religious faith and such a philosophy seems quite clear. The views upheld here could be tentatively expressed in a phrase like that:*

*"*Since atoms are inert, atomic theory can be used to prove existence, wisdom and omnipotence of God*".*

A somewhat different case was that of ***Marin Mersenne*** *(1588-1648). He was a French monk, a member of the 'Minims' ("the least ones"), a mendicant order of friars, one of the most ascetic orders in all of France. He feeled a threat of atheism (as represented, for him, mainly by the Italians: Pomponazzi, Cardano, Vanini etc.) He proclaimed a war on all occult philosophies: hermetism, alchemy, natural magic (as one of his main enemies he considered Robert Fludd). He a*ttacked the doctrine of the *anima mundi*, for this would eliminate all individual responsibility. *He made plenty of experiments. His main works: Questiones celebirrimae in Genesim* (1623), *L' impiet**é** des déistes* (1624). (Ashworth, 138-139)

*His views have an almost positivist tone:*

[6] Charleton, *Physiologia* (quoted in Deason, 179-180)

*"It seems that the capacity of men is bounded by the bark and by the surface of corporeal things, and that they cannot penetrate further than quantity with complete satisfaction."* *"One is constrained to acknowledge that man is not capable of knowing the reason of anything other than that which he can make, nor other sciences than those of which he makes the principles himself, as one can demonstrate in considering mathematics." [The objects of physics belonged to] "the things that God has created," [but] "we know the true reasons only for things that we can make with the hand or with the mind", [and] "of all the things that God has made, we cannot make a single one."7*

*[Since] "we cannot know the true reasons or science of what happens in nature, because there are always some circumstances or instances that make us doubt whether the causes that we imagine to ourselves are genuine […] or whether there could be others, I do not see that one ought to require anything else of the most expert scientists (*sçavans*) than their observations and the note which they have taken of the different effects or phenomena of nature" [*For whenever] "we try to find the primitive and original reason for the phenomena of nature", [we face defeat because] "we were not there when its foundations were laid" [and] "its effects do not lead us evidently enough to the source to convince us […] by the force of a perfect demonstration"8

*The contribution of* ***René Descartes*** *(1596-1650) to the establishment of the mechanical philososphy is well known. More problematic are his relations to the catholic doctrines. He rather preferred to eliminate theology in such discussions altogether. He had a disdain for theological arguments drawn from nature. He rejected any doctrine of final causes: Watever the purposes of God, they were too impenetrable to be discerned by mere observation of nature. (Ashworth, 139-140).*

*Interesting is how he de-spiritualizes the spirits of Galenists: Animal spirits consist simply of material atoms. Animal spirits "have no other property than that they are very small bodies that move very fast […] and do not stop in any one place." They are already present as the „liveliest, strongest, subtlest" particles in the blood reaching the brain. These particles "climb straight up to" the brain since, being the liveliest they are most inclined, by their momentum, to travel in a straight line, and the carotid arteries give them a better chance to do this than do any other blood vessels carrying blood from the heart. On their arrival, specifically in the blood vessels surrounding the conarium or pineal gland, they separate from the coarser blood particles and leaving the bloodstream pass first into the pineal gland and then to the brain ventricles.(Hall, 258-259)*

[7] Mersenne, *La vérité des sciences* (quoted in: Crombie, I, 45-46)
[8] Mersenne, *Harmonie universelle* (quoted in: Crombie, II, 814-815)

### *Mechanical philosophy and Protestant Christianity*

*Another element must be taken into account in countries or circles in which protestant doctrines predominate. According to these doctrines God's sovereignty excludes man's active participation in his salvation. According to Luther:*

*This most excellent righteousness, the righteousness of faith, which God imputes to us through Christ without works, is neither political nor ceremonial nor legal nor work-righteousness but is quite the opposite: it is a merely passive righteousness, while all the others, listed above, are active. For here we work nothing, render nothing to God; we only receive and permit someone else to work in us, namely, God. Therefore it is appropriate to call the righteousness of faith or Christian righteousness "passive".9*

*This doctrine on the* radical *sovereignty of God can be extended to the view that God's sovereignty excluded the active contribution of lesser beings to his work. (Deason, 170). Furthermore, discussing the theory of spontaneous generation, a theory accepted from ancient times on and seemingly involving quasi-spiritual entities, he remarks:*

*If you should ask by what power such a generation takes place, Aristotle has the answer that the decayed moisture is kept warm by the heat of the sun and that in this way a living being is produced, just as we see dung beetles being brought into existence from horse manure. I doubt that this is a satisfactory explanation. The sun warms, but it would bring nothing into being unless God said by His divine power: "Let a mouse come out of the decay."10*

This view, most characteristic of Protestant circles, could be expressed in a phrase like that:

*"*God's sovereignty, wisdom and omnipotence, rightly understood, presuppose that he acts directly and not through other entities*."*

*As said before, there were several varieties of the mechanical philososphy. An interesting case was that of Robert Boyle – also since he was a very pious Christian (a Puritan).* ***Robert Boyle*** *(1627-91) had centered his whole life on Christian practice. He followed the strictest puritanical code, he abstained from tobacco, alcohol, excesses in any form. According to Bishop Burnet:, "his main design in that, […] was to raise in himself and others vaster thoughts of the greatness and glory and of the wisdom and goodness of God." (Westfall, 40-41) His main works:* The Usefulness of Experimental Philosophy *(between 1649 and 1653),* A True Inquiry into the Vulgarly Received Notion of Nature *(1686),* A Disquisition about Final Causes *(1688).*

*According to Westfall, Boyle was "the most influential publicist of the mechanical*

[9] Luther, quoted in: Deason, 173
[10] Luther, quoted in: Deason, 175-176

*philosophy in England". (Westfall, 73) But he rejected an Epicurean and Cartesian view of the atomic theory:*

*I do not at all believe, that either these* Cartesian laws of Motion*, or the* Epicurean casual concourse *of Atoms could bring mere Matter into so orderly and well contriv'd a Fabrick as this World. […] So that according to my apprehension it was* at the beginning *necessary, that an intelligent and wise Agent should contrive the Universal Matter into the World, […] yet I think it utterly impossible that* brute and unguided*, though* moving*, Matter should ever convene into such admirable structures, as the bodies of perfect Animals. But the world being once fram'd and the course of Nature establish'd, the Naturalist […] in explicating particular Phenomena considers only the Size, Shape, Motion, (or want of it,) Texture, and the resulting qualities and attributes of the small particles of Matter.11*

*Here we have an insistence on the searching for natural laws, as we find it e.g. in Newton. And the 'naturalist' can (and should) explain phenomena not by reference to hypothetical forms or souls, but by taking into account a "concourse of natural agents" or "the texture of the body":*

*I fear, [...] [that] we sometimes attribute to the specifick form or soul things that may be well enough performed without it by the more stable modification of the body, befriended by an easy concourse of natural agents. […] even in animals some things that are confidently presumed to be the proper effects of the animal's soul may be really performed by the texture of the body, and the ordinary and regular concourse of external causes.12*

Even regarding the 'crisis' of a disease, which was for the ancients a main example for the intervention of the 'vis medicatrix naturae', he attributes it "to the *wisdom and ordinary province of God":*

*The universal opinion of physicians is, that [at the crisis] it is that intelligent principle they call nature, which […] watches her opportunity to expell […] [morbific matter] hastily out of the body. [...] [We sould attribute crisis] to the wisdom and ordinary province of God, exerting itself in the mechanism partly of that great machine the world, and partly of that smaller engine the human body.13*

He accepts final causes (particularly in living beings), but only through God's providence or intervention

*[The difference of shape between the eyes] of cats and those of horses could be*

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11 Robert Boyle, *The Origins of Forms and Qualities (According to the Corpuscular Philosophy)*, quoted in: Roger, 283

12 *Boyle*, Free Considerations*, quoted in: Hall, 286*

13 *Boyle,* A Free Enquiry into the Vulgarly Received Notion of Nature*, quoted in: Hall, 289*

*explained in the following way: the reason may be, that horses and oxen been usually to find their food growing on the ground, they can more conveniently receive the images of the laterally neighbouring grass, etc., by having their pupils transversely placed; whereas cats, being to live chiefly upon rats and mice, which are animals, that usually climb up or run down walls and other steep places , the commodiousest situation of their pupil, for readily discovering and following these objects, was to be perpendicular.14*

## Objections to mechanical philosophy

Among those who were against mechanical philosophy we have to mention ***Thomas Sydenham*** *(1624-1689). He was named "the English Hippocrates", not only because of his greatness, but also because he followed some ancient views. He has served as an officer in the Parliamentarian army during the Civil War. According to him, nature is a hierarchy of creatures, each driving to realize the end for which it was created, governed by a law but not a mechanical law. All creatures "are put under laws, by which they are determined to such or such operations suitable to the ends of their several beings." (Westfall, 72)*

*But the strongest voices against mechanical philosophy in England came mainly from the so-called* ***Cambridge Platonists****: mainly Henry More and Ralph Cudworth.*

***Henry More*** *(1614-1687) accepted in 1675 a prebend in Gloucester Cathedral, but only to resign it.* ***Ralph Cudworth*** *(1617-1688) was installed prebendary of Gloucester in 1678.*

*They introduced the concept of* 'plastic nature' – *reminding, in some aspects, on the one hand, spiritual entities, on the other the 'vis vitalis' (vital force) of the late 18th or early 19th century. It was used in order (a) to provide God with an instrument through which He governs the universe and intervenes in its operations when necessary, (b) to absolve God of responsibility from phenomena that seem to deny His goodness. (Westfall, 84)*

*An advocate of this concept was* ***John Ray*** *(1627-1705). He was an Anglican priest. His interests centerd on botany, zoology, natural history, also natural theology. He wrote a* History of Insects *(1710). In it he describes how a wasp, after burying a caterpillar which it had killed and covering the hole, it placed two pine needles as if to mark the location. And exclaims: "Who would not wonder in amazement at this?" "Who could ascribe work of this kind to a mere machine?" In order to explain, in a satisfactory way, the phenomena of life, Ray had recourse to the principle of "plastic nature", which postulated a spiritual vicegerent of God pervading the natural order and governing its operations. (Westfall, 93-94)*

*His objections are also against the concept of natural law*

14 *Boyle,* A Disquisition about the Final Causes, *quoted in: Roger, 284*

*This hypothesis, I say, I cannot fully acquiesce in, because an intelligent being seems to me requisite to execute the laws of motion. […] And as for any external laws or established rules of motion, the stupid matter is not capable of observing or taking any notice of them, but would be as sullen as the mountain was that Mahomet commanded to come down to him; neither can those laws execute themselves. Therefore there must, besides matter and law, be some efficient, and that either a quality or power inherent in the matter itself, which is hard to conceive, or some external intelligent agent, either God himself immediately or some plastic nature.15*

## *The 'new science' and the art of wondering at God's works*

*To a great extent, people we are dealing with here used the findings of the new science to highlight the wisdom and omnipotence of God. It is interesting to exmaime in which way they were trying to accomplish it. I shall be referring mainly to English 'virtuosi'.*

***Walter Charleton** states somewhere: If I knew an atheist, "I would do my best to bring him into this theater [for anatomical dissection], here to be sensibly convinced of his madness."16 And **Boyle**: "On the opened body of the same animal a skillful anatomist will make reflections as much more to the honor of its Creator than an ordinary butcher can, as the music made on a lute by a rare lutanist will be preferable to the noise made on the same instrument by a stranger unto melody."17*

*It must be stressed that, on the contrary, e.g., both Paracelsus and Sydenham were strongly against anatomy – they believed that it offers only unreliable and useless observations and shows us nothing on the causes and processes of diseases.*

***Robert Hooke** (1635-1703), the great microscopist, who was not particularly religious, extolls the importance of the microscope for discerning the "secret workings of nature":*

*It seems not improbable but that by these helps [the microscope] the subtlety of the composition of bodies, the structure of their parts, the various texture of their matter, the instruments and manner of their inward motions, and all the other possible appearances of things, may come to be more fully discovered; all which the ancient Peripatetics were content to comprehend in two general and (unless further explained) useless words of matter and form. From whence […] we may perhaps be enabled to discern all the secret workings of nature, almost in the same manner as we do those that are the productions of art, and are managed by wheels and engines and springs that were devised by human*

15 Ray, *Wisdom of God*, quoted in: Westfall, 94-95
16 Walter Charleton, *Enquiries into Human Nature in Six Anatomic Prelections in the New Theatre of the Royal College of Physicians in London* (London, 1680), quoted in: Westfall, 113
17 *Boyle,* Works*, 2, quoted in: Westfall, 43*

*wit.18*

***John Ray*** *points out, that the stars in heavens are innumerable and each improvement in the telescope reveals much more; that every star has planets around it etc.; that on the earth there are at least a hundred and fifty species of beasts, some five hundred species of birds, perhaps three thousand fish, twenty thousand insects, and more plants. And if the number of creatures be so exceeding great, he asks himself, how immense must be the power and wisdom of Him Who made them? "For […] as it argues and manifests more skill by far in an artificer to be able to frame both clocks and watches, and pumps and mills, and granadoes and rockets, […] so the Almighty discovers more of His wisdom in forming such a vast multitude of different sorts of creatures, […] than if He had created but a few; for this declares the greatness and unbounded capacity of His understanding." (Westfall, 45-46)*

And ***John Wilkins*** *(1614-1672)*, an *Anglican clergyman,* bishop *of Chester (from 1668 until his death)* and one of the founders of *the Royal Society, argues that astronomy "proves a God and a providence, […] and incites our hearts to a greater admiration and fear of His omnipotency. 'We may understand by the heavens how much mightier He is That made them; for by the greatness and beauty of the creatures proportionally the Maker of them is seen,' says the book of* Wisdom*. […] Such a great order and constancy amongst those vast bodies could not at first be made but by a wise providence, nor since preserved without a powerful inhabitant, nor so perpetually governed without a skillful guide."19*

*A question that naturally arises here is the following: Are the observations provided through anatomy and the use of microscope, telescope etc. the best means to rouse in us an admiration for God? Is the number of heavenly bodies or of different living beings a measure for God's power? In what sense are these more admirable as God's creations than e.g. the internal alchemist as described by Paracelsus – as well as the other innumerable spiritual entities? The answer is of course that these people did not recognize, did not see these entities. It has to be stressed that for the 'others' – as well as for the ancients – these entities were not hypothetical (in the sense we put it today and also e.g. Mersenne seems to imply), they were reality – and the most important reality.20*

So we have here a real gap between the followers of the 'new science' and the 'others', a radically different way of seeing the world. The views of the former correspond, to a great extent, to that of Mersenne quoted above. In that sense, *we could*

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[18] Hooke, *Micrographia*, quoted in: Westfall, 71-72
[19] *Wilkins,* A Discourse Concerning a New Planet*, quoted in: Westfall, 34*
[20] See: G. Papadopoulos, Betrachtungen über den Sinn und die Rolle der Erfahrung bei Paracelsus, *Nova acta paracelsica*, Neue Folge 20/21 (2006/07) 65-83 & 22/23 (2008/09) 89-119

*formulate still another phrase:*

*"*Since we have no access beyond outer appearance and quantity, our admiration for God's wisdom, goodnes and omnipotencɛ has to be based on these aspects*."*

*But there were voices against such views. Such was the case of* ***Richard Baxter*** *(1615-1691). He was an English Protestant and in 1638 he commenced his ministry. He accused the Epicureans that they looked so much at corporeal things and they overlooked the noblest aspects of nature; since they studied nothing but matter and motion thoroughly, they reduced everything to those principles. "And like idle boys who tear out all the hard leaves of their books and say they have learned all when they have learned the rest, so do they cut off and deny the noblest parts of nature and then sweep together the dust of agitated atoms and tell us that they have resolved all the phenomena of nature."21 And, in another place:*

*If the wisest men in the world tell them that they see it or know it, if the workers of miracles, Christ and His Apostles, tell them that they see it; if God Himself tells them that He sees it; yet all this does not satisfy them unless they may see it themselves. […] Every man has an understanding of his own, and therefore would have a sight of the evidence himself, and so have a nearer knowledge of the thing, and not only a knowledge of the truth of the thing by the testimony of another, how infallible soever.22*

## Some conclusions

*We have seen, in some outlines, how the mechanical philosophy became influential and how, to the extent it advanced and predominated in 17th century, spiritual entities were disregarded or rejected. We have also seen, that Christian faith was no obstacle to such a development; on the contrary, most of the important and influential supporters of this philosophy were pious Christians and even clergymen or monks. Moreover, mechanical philosophy was used in order to extoll God's omnipotence, to incite an admiration for God's works and to combat atheism. In this respect it seems to exist no important differences between Catholics and Protestants (or Anglicans or Puritans).*

*On the other hand, those who continued to uphold – even in a more marked way – the older views with the central role of spiritual entities and powers, or those who opposed mechanical philosophy and its consequences, were mostly pious Christians. One could try to investigate whether (and to what extent) these last groups belonged to the so-called 'esoteric Christianity', like e.g. Paracelsus or Jacob Boehme. This would be, I think, an interesting line, but I do not intend to follow it here.*

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21 Baxter, *The Reasons of the Christtian Religion* (Westfall, 22-23)
22 Baxter, *The Arrogancy of Reason against Divine Revelations Repressed*, quoted in: Westfall, 22

*I tend to think that the crucial element was that a large part of scientists, philosophers etc. became unable to 'perceive', to 'see' or to understand spiritual entities – or, alternatively, became convinced that the references to spiritual entities by the ancients or by the 'others' were based on something like an illusion, or that they used these concepts simply as hypothetical ones. Following that, since the admiration for God's works was necessary and indispensable for good Christians, it had to be based on the observable and quantifiable data, including those accessible by the new technologies (telescope, microscope etc.) In that way one moreover avoided problems that would arise concerning the relations of such hypothetical entities to God and their possible interference with his work. For those who did not care so much for admiring God the situation was at any case quite easy.*

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# TRANSCENDING THE CONFLICT BETWEEN SCIENCE AND THEOLOGY. LEMAÎTRE & IBN RUSHD COMPARED.

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## Introduction

Is it possible to perform scientific reasoning leading to conclusions at first sight and to the outsider in manifest contradiction with somebody's personal religious convictions? The medieval Arabic philosopher Ahmad Ibn Rushd and the 20th century scientist George Lemaître, author of the primeval atom model (later called 'big bang theory'), hold at first glance a comparable position. Both deeply religious they maintained (natural) philosophical ideas incompatible with a textual reading of the respective scriptures. In this paper I present their perspectives on the relation between religion and science, intertwined with their personal beliefs and life course. I will go somewhat deeper into the content of Lemaitre's cosmogony and development thereof (to better understand the scientist-priest). Thereafter I focus on Lemaître's conflict with the Vatican. Also in the case of Ibn Rushd there was a conflict with the religious leaders. Then I compare their views, using the frameworks of Ian Barbour and Lieven Boeve. Lemaître and Ibn Rushd uphold the *difference* model. There might be one Truth (Ibn Rushd and also Lemaître, in a sense), there might be two (or more) different methods to reach true propositions (Ibn Rushd and Lemaître), there might be two realms in reality (a theological-ethical and natural philosophical, Lemaître) but science and religion are distinct disciplines to approach the world and science always has the last word in case of conflict (Ibn Rushd and Lemaître). I add the models of *interdependence*: *dependence* of religion (Ibn Rushd) and *injectivity* by religion (Lemaître). I conclude that Ibn Rushd and Lemaître both wanted to avoid an interference of religion with science (which Lemaître called 'mix'), not able to bypass that interdependence.

## Georges Lemaître

Georges Henri Joseph Edouard Lemaître was born on July 17, 1894, Charleroi (Belgium), and died in 1966, Leuven (Belgium). When he was nine years old he said het wanted to become a "scientist and priest". He attended the local parish elementary school and the Jesuit high school. (Laracy, 2009) Once seventeen he went to the College of Engineering at *l'Université Catholique de Louvain*. Two years later he acquired his bachelor's degree in mechanical engineering. In the mean time he took classes at the *Higher Institute for Philosophy* in Leuven as well. He started to work as a mining engineer (Berger, 1984), but that career ended abruptly when Belgium was invaded by the German army in 1914. Georges and his brother Jacquesto joined the Fifth Corps of Volunteers. (Laracy, 2009) For his bravery he was awarded *la Croix de guerre avec palmes* (War Cross with palm leaves).

Immediately after the Great War he went back to the Catholic University and earned quickly his bachelor's degrees in mathematics and philosophy. At the *Higher Institute for Philosophy* Lemaître was trained by neo-Thomists like Cardinal Desiré Joseph Mercier (1851-1926) — founder of the renowned *Institute,* holder of the *Chair of Thomistic philosophy* — and cosmologist Desiré Nys (1859-1927). (De Wulf 1928) Neo-Thomism (also called neoscholasticism) was a revised version of the philosophical system of Thomas Aquinas (1225–1274). According to Mercier, cosmology had a threefold task, namely to discern (i) the origin of the inorganic world, meaning its first efficient cause; (ii) its intrinsic constitution or ultimate constitutive causes; and (iii) its destiny or final cause. (Kragh 2008)

In 1920 at the age of 26, Lemaître defended his dissertation *Approximation of functions of many real variables* with *summa cum laude*. (Laracy, 2009) Although he was offered an academic career, he decided to go for his priesthood studies at the seminary of the Archdiocese of Mechelen (Belgium). He kept his interest in theoretical physics, studying special and general relativity theory during his leisure time. Arthur Eddington, asked in 1919 whether it was true that only three people in the world understood the theory of general relativity, allegedly replied: "Who's the third?" One year later, for sure, Lemaître would be one of the few grasping Einstein's work to the bone.

In 1923 he was ordained as a priest, in service to archbishop and cardinal Mercier. Soon after Georges was granted a three year leave: he had obtained a fellowship from the *Belgian American Educational Foundation* that enabled him to study abroad. First he went to visit Eddington at the *University of Cambridge* (U.K.) to specialize in stellar astronomy, relativistic cosmology and numerical analysis. (Luminet 2013; UCL 2010) The second year he spent at *Harvard College Observatory* in Cambridge, Massachusetts,

supervised by Harlow Shapley who worked on the problem of nebulae. (Luminet 2013) Lemaître attended a meeting in Washington (December 30, 1924 – January 1, 1925) where a paper of Hubble was read (Hubble himself was not present) announcing the discovery of Cepheid stars in spiral nebulae. (Berendzen 1971; contrary to Luminet 2013) Henrietta Leavitt discovered in 1912 that the period of luminosity of these particular stars (over a couple of days their brightness varied) related to their average brightness. Since the distance to some of these stars was known, the stars could serve as standard candles to measure the distance to other objects of which they were part of, in casu the spiral nebulae. If spiral nebulae were remote islands of stars, the implications for relativistic cosmology would be reaching. Probably Lemaître learned about Hubble's discovery at least a month earlier, because it already appeared in the *New York Times* of November 23, 1924. (Berendzen 1971; contrary to Luminet 2013) Anyhow, it was evident that Lemaître – a fresh member of the *International Astronomical Union* – subsequently went to the *Massachusetts Institute of Technology* (M.I.T.), where Vesto Slipher and also Edwin Hubble were active. Slipher discovered in 1914 the rotation and high radial velocity of nebulae and had by 1922 measured the redshift (frequency shifts indicating relative motions) for forty-two nebulae. (Livio 2011) Eddington commented a year later in his book *Mathematical Theory of Relativity*, commenting that "the great preponderance of positive [receding] velocities is very striking." Rightly, Eddington did no venture further conclusions because Slipher's observations only included nebulae visible at the northern hemisphere.

Lemaître (1925) deduced that the relation between the relative speed of points and their mutual distances was linear for a De Sitter universe model: spatially flat, neglecting matter, with a prominent role for the cosmological constant λ (introduced by Einstein about ten years earlier to allow for static models, which he favoured). That was the first time the cosmological constant expressed a 'cosmic repulsion'. (Luminet 2013) Lemaître realized, although this non-static feature was empirically very promising because of its connection to the redshifts of nebulae, the model resulted in an infinite Euclidean space, which he *as a neo-Thomist* considered inadmissible. (Luminet 2013) Lemaître did not accept the actual infinite, remained faithful to the finitude of space and matter throughout his career. (Kragh 2007; Luminet 2013) Hence, he had to seek for an alternative explanation, involving a truly non-static and spatially closed solution of Einstein's equations. Already in 1925 it looks like Lemaître considered the possibility of an expanding universe, but it took another two years until he explicitly suggested such a model. (Kragh 2007)

Lemaître travelled back to Belgium that year but returned to the *M.I.T.* in 1927 to write a second PhD, this time in physics, supervised by H.M. Godwin: *The gravitational field in a fluid sphere of uniform invariant density according to the theory of relativity; Note on de Sitter Universe; Note on the theory of pulsating stars*. (Laracy 2009) Eddington suggested the topic. (Luminet 2013) Lemaître was exempted of oral defence, since he already stayed in Belgium since June 1927. Eddington recommended him to the *Université Libre de Bruxelles* (Free University Brussels), if *l'Université Catholique de Louvain* would not take him. But he was appointed there, rightfully, as associate professor in mathematics. (Deprit 1984, 370-1)

In that same year, 1927, he published his famous article *Un Univers homogène de masse constante et de rayon croissant rendant compte de la vitesse radiale des nébuleuses extra-galactiques* in the inconspicuous *Annales de la Société Scientifique de Bruxelles*. (Lemaître 1927) As the title clearly states, he was able to connect the expansion of space arising from the dynamical cosmological solutions of Einstein's field equations with recent observations of the recession velocities of extragalactic nebulae. (Luminet 2013) Lemaître was at that time unaware of Alexander Friedmann's nine years earlier work of which he actually duplicated the mathematics. He learned about Friedmann's publication from Einstein, later that year. (Kragh 2007) At that same occasion, the fifth and most illustrious *Solvay conference* in Brussels, Einstein would have said to Lemaître: "your calculations are correct, but your grasp of physics is abominable." (Midbon 2000) Lemaître, indeed, went further than Friedmann, beyond mathematics so to speak: he also determined the *rate of expansion* of the Universe based on the velocities of the nebulae measured by Slipher (published by Gustaf Strömberg) and the *distances* to them as determined from *brightness measurements* published by Edwin Hubble in 1926. Lemaître derived a recession rate of 625 kilometres per second per megaparsec, but he expressed his own doubts about the linear relation because of the accuracy of Hubble's distance estimates. (Livio 2011)

In 1929 Hubble published his celebrated paper titled *A relation between distance and radial velocity among extra-galactic nebulae* (1929), introducing his law, based on Cepheid distances measures and Sliphers velocities, with a value of 500 kilometres per second per megaparsec for the later so-called Hubble constant. As an astronomer, Hubble was not keen to make more of the data than merely the apparent relation between redshift and distance. Hubble actually never believed in Lemaitre's solution, an expanding universe. (Shaviv 2011) Whether Hubble knew about Lemaître's 1927 article we will probably never know. However, Hubble was very possessive about his law as he makes crystal clear to De Sitter in a letter dated August 21, 1930: "I consider the

velocity-distance relation, its formulation, testing and confirmation, as a Mount Wilson contribution and I am deeply concerned in its recognition as such."

In 1931, four years after the French version, Lemaître's article was translated into English: *A homogenous Universe with constant mass and increasing radius accounting for the radial velocity of extra-galactic nebulae* (Lemaître 1931a). Lemaître himself omitted in the translation the crucial passages where he derived Hubble's law and a first value for Hubble's constant. For Lemaître there was no point in repeating an out-dated value nor to come back on the 'provisional discussion of radial velocities' "which is clearly of no actual interest" – as he typed in his letter to the editor of the *Monthly Notices of the Royal Astronomical Society*. (Livio 2011). To Lemaître it was futile to come back on the matter of priority, at that time. In the same letter he was clearly more interested in a fellowship of the *Royal Astronomical Society* (which he got eight years later) and the publication of a new paper on *The expanding Universe*. So, immediately after the revised English translation, this article appeared in which he claimed that the expansion of space started $10^{10}$ years ago after an "age of stagnation". (Lemaître 1931b) But in 1950, it looks like Lemaître wanted to dot the i: his intentions were clearly, he wrote, as the title of the original paper unambiguously read "A Universe with a constant mass and increasing radius as an explanation of the radial velocity of extra-galactic nebulae", uniting theoretical physics and practical astronomy. (Lemaître 1950) The observations by Hubble and his assistant Humason *confirmed* the linear velocity-distance relation as *formulated* by Lemaître. (Nussbaumer 2009; Block 2013)

Yet another pioneering paper was published that year by Lemaître, this time in *Nature*: *The Beginning of the World from the Point of View of Quantum Theory.* (Lemaître 1931c) Therein he states: "we could conceive the beginning of the universe in the form of a unique atom, the atomic weight of which is the total mass of the universe." This marks the commencement of the primeval atom theory, today known as the 'big bang theory'. That name was given in 1948 by Fred Hoyle, Lemaître's opponent, actually to make fun of it. Lemaître, however, is not without blame. Shortly after the publication in 1931, he spoke as follows about his idea: "We must have a fireworks theory of evolution. The fireworks are over and just the smoke is left. Cosmology must try to picture the splendor of the fireworks." (Lemaître in Vecchierello 1934, 19) So, yes, the universe came about with a big bang. More interesting, however, is that although Lemaître wrongly thought cosmic rays (gamma rays) are the remaining radiation of the beginning, he did suggest that a cosmic background radiation should exist. Finding the 2.7K radiation in 1964, two years before Lemaître's death, confirmed his theory.

In 1951 Pius XII gloriously said that 'big bang theory' was a confirmation of Christian cosmogony. The pope started his argument with two arguments (Pius XII 1951):

(1) la mutabilità delle cose, compreso il loro nascere e la loro fine;

(2) l' ordine di finalità che riluce in ogni angolo del cosmo.

First, he mentioned the changeability of the universe. Therefore an immutable being had to have created the dynamical physical world. Secondly, he pointed out to the apparent organization towards a certain end that characterizes the entire universe. Pius assumed that God's creation of the world began with the early stages Lemaître had described in his primeval atom theory. "It seems that contemporary science has succeeded in being a witness to the primordial 'Fiat Lux'. So modern science has confirmed in that stringent way characteristic to physical proofs the contingency of the universe and the legitimate deduction to the time that the world came about by the hand of the Creator." (Pius XII 1951) Lemaître strongly opposed to this conclusion. The first premise was evidently not a problem. It was the second premise that was unacceptable for Lemaître, as was the hidden premise that his cosmology described the interaction between God and the world. How did Lemaître react?

Back in 1891 Mercier, Lemaître's inspiring professor, emphasized that the purpose of the *Higher Institute* was "to form, in greater numbers, men who will devote themselves to science for itself, without any aim that is professional or directly apologetic." (Mercier in De Wulf 1956, 270) Although many Catholic scientists fell for the temptation to use science apologetically, this was not the aim of neo-Thomism. (Kragh 2009) Lemaître showed to be a true disciple. As Mercier taught him philosophy and theology, ordained him, inspired him, he had a profound influence on him. Because Lemaître's thoughts were deeply rooted in neo-Thomism, he never made the mistake of identifying the initial 'fireworks' with the event of creation. Georges well understood that physical cosmology studies change, while creation is not a change. (Laracy 2014) Again, he was faithful to Mercier and other professors like Desiré Nys. In his *Cours de philosophie*, which Lemaître attended, Nys examined in detail the claim that the second law of thermodynamics implied a beginning and an end of the world. (Kragh 2008) "Did the world have a beginning? Only faith permits us to respond to this question with complete certainty." (Nys 1913, 193) According to Nys, human reason was unable to provide a definite proof against the possibility of an eternal world. Lemaître concurred, declaring that a cosmological theory could never be used as *evidence* (or counter-evidence) for a theological truth. By the way, the law of increase of entropy played a significant role in Lemaître's thinking that led to the 1931 article.

"Even if science could demonstrate that the actual state of this world as we find it had a commencement," Mercier wrote with his colleagues in the *Manual of Modern Scholastic Philosophy*, "reason alone could never be sure that this state was not endlessly preceded by some other state of which science is entirely ignorant. In any case it is imprudent […] to identify the question of the existence of God with that of the commencement of the world." (Mercier in Parker 1916, 47) Lemaître clearly stated, regarding the primeval atom era, "we may speak of this event as of a beginning. I do not say a creation." (Lemaître in Godart 1985, 170) There was no way to confuse the natural beginning as physically described with the creation in the theological sense. According to Lemaître, science and theology use *a different discourse model*, *different semantics* and a *different methodology*. It is not that there is one and the same truth science and religion both strive for: it is more like science and religion lead up to true propositions. This follows when Lemaître tells us "the idea that *because* [the writers of the bible] were right in their doctrine of immortality and salvation *they must also be right* on all other subjects is simply the fallacy of people who have no comprehension of why the bible was given to us at all." (Lemaître in Krach 1996, 59) Science and religion have a different purpose. As far as religion is concerned, Lemaître is very clear: "Salvation, not nature, is what religion is about." (Ibidem)

In an interview Lemaître gave to the *New York Times Magazine*, "there are two ways to reach the truth. I decided to follow both. Nothing in my professional life, nothing of which I learned in my scientific and theological studies has made me think otherwise. Never has science shaken my religion, nor has religion forced me to doubt the conclusions I reached through scientific methods." (Lemaître 1933)

Speaking on the topic of his model at the eleventh Brussels Solvay Conference in 1958, Lemaître said: "As far as I can see, such a theory remains entirely outside any metaphysical or religious question. It leaves the materialist free to deny any transcendental Being. He may keep, for the bottom of space-time, the same attitude of mind that he has been able to adopt for events occurring in nonsingular places in space-time." (Lemaître 1958) God is outside the realm of cosmology; therefore cosmology can be perfectly practiced by religious or non-religious people. A conflict between cosmology and theology is impossible. Science and religion are different in too many aspects, which does not mean that they can inspire each other (like neo-Thomism motivated Lemaître).

## Ahmad ibn Rushd

Abū 'l-Walīd Muḥammad ibn Aḥmad ibn Rushd was born in 1126, Córdoba (Spain) and died in 1198, Marrakesh (Morocco). In Latin Europe he was better known as Averroes (Ibn Rushd → Abnrois → Averroes). His grandfather was imam and judge, as was his father. Ibn Rushd travelled back and forth between Córdoba and Marrakesh. In Córdoba the young scholar had access to the famous library of al-Hakam, the Umayyad Caliph of Spain. Traditionally he started his studies with linguistics, jurisprudence and scholastic theology. (Hillier) Afterwards he studied Aristotelian philosophy, logic, astronomy, music and medicine, as almost all medieval scholars did at that time (although in Europe everybody would start with bachelor studies in philosophy — including Aristotelianism, astronomy and music — studying law, medicine and/or theology afterwards for a master degree). Those that could afford it learned everything there was to know. (Marvin 2000) Subsequently, Ibn Rushd published treatises on all these subjects.

The Caliph of Morocco appointed Ibn Rushd as chief judge and later as personal physician and advisor. He was likely involved in the educational reform the Almohad leaders envisioned. On request of the Prince, Ibn Rushd started to write commentaries on Aristotle. In jurisprudence, he adhered to the views of Ibn Toemart: reason suffices to establish God's existence and any ethical legal theory *depends* on divine transcendence. The Alhomads evolved gradually towards liberalism and eventually opposed to Ibn Toemart's view on law. Ibn Rushd became the scapegoat, his books were burned, and he was banished to Lucena, just outside Córdoba, albeit only for two years. (Hiller) Although Ibn Rushd criticized a lot of his contemporaries and predecessors, especially the reputable al-Ghazali, several colleagues came to the rescue and convinced the Caliph to show some mercy. Ibn Rushd was allowed to return to Marrakesh, two years before his death. He went down in history as the Commentator of Aristotle. (Marvin 2000)

Ibn Rushd wrote in 1180 his *Tahafut al-Tahafut* (The incoherence of the incoherence): a fierce reply to the anti-philosophical treatise of al-Ghazali (*Tahafut al-Falasifa*, The incoherence of the philosophers) in which the author claimed that Aristotelian philosophy was an insult to Islam because it simply was inconsistent. Al-Ghazali, also known as Algazel in the West, was to many Sufists the second teacher after Muhammad.

Ibn Rushd reconciled Aristotelian philosophy with the Quranic verses and argued that there were three ways to reach knowledge: (1) demonstrative reasoning (logical reasoning) is the tool of the Islamic philosophers, (2) dialectic the tool of the theologians, and (3) rhetoric the tool that best serves 'the masses'. (Kemal 1986, 120; Borrowman 2008, 349) Religion (through rhetoric) is there to convince the masses,

deduction is the method to serve theologians and induction (demonstrative reasoning) is to be used by philosophers (i.e. scientists).

The *Kitab Fasl al-Maqal* is Ibn Rushd's 'definitive treatise' of 1190, *determining the nature of the relation between religion and philosophy*. He writes: "Now since this religion is true and summons to the study which leads to the knowledge of the Truth, we the Muslim community know definitely that demonstrative study does not lead to [conclusions] conflicting with what Scripture [or Religious Law] has given us; *for truth does not oppose truth but accords with it and bears witness to it*." (Ibn Rushd in Brozek) Philosophy (natural philosophy) and theology can only seemingly contradicting each other. To Ibn Rushd, philosophy was the most stringent, hence the best, and therefore its study should better not be prohibited. (Hillier) He finds verses in the Quran to substantiate this.

Soon after Muhammad's death already scholars elucidated obscure words and formulations in the Quran. "For this purpose examples were required from linguistic sources other than the Quran itself, and these could most readily be found in the older Arabic poetry". (Borrowman 2008, 350) Ibn Rushd went a big step further, making a case for an allegorical interpretation of the Quran with philosophy as a guide:

"We affirm definitely that whenever the conclusion of a demonstration is in conflict with the apparent meaning of Scripture [or Religious Law], that apparent meaning admits of allegorical interpretation according to the rules for such interpretation in Arabic." (Ibn Rushd in Adamson 2005, 186)

By the nature of the Quran (the fact that it is obscure) it is possible the prevailing interpretation is not adequate. The alleged meaning should therefore be corrected in view of the philosophical findings, according to the traditional rules. He continues:

"We may say that whenever a statement in Scripture conflicts in its apparent meaning with a conclusion of demonstration, if Scripture is considered carefully, and the rest of its contents searched page by page, there will invariably be found among the expressions of Scripture something which in its apparent meaning bears witness to that allegorical interpretation or comes close to bearing witness." (Ibn Ruhsd in Adamson 2005, 186)

Evidently, there will always be found an allegorical interpretation of the Quran that concurs with the results of philosophical research. So, according to Ibn Rushd, philosophy yields true propositions, and so does the Quran. If there is a contradiction between *demonstratively true philosophical expressions* and *deductively true theological conclusions* made from the Quranic verses, the interpretation of the verses needs to be revised in order to result in theological conclusions that are consistent with the

philosophical findings. But Ibn Rushd does stress that these philosophical findings only overrule a prevailing Quranic interpretation, if the correct method has been followed.

In conclusion: first, when a contradiction appears, it is the reading of the scripture and not the argument of natural reason that has to be modified, and, second, the presented way of resolving the apparent conflicts between faith and reason is applicable only when the 'natural' reasoning involved deserves the name 'demonstration'. (Brozek, 4) And, as far as religion is concerned, religious conceptions are the symbols of a higher philosophical truth, symbols that have to be taken for reality itself by the non-philosophers. (Tahafut al-Tahafut, last chapter) Religion is a rhetorical system to persuade the cognitively incapacitated of the theological truths adapted to philosophical knowledge reached through demonstration (i.e., empirically proven hypotheses).

Ibn Rushd's commentaries on the classics and his contemporaries "served as a primary means through which the Arabic Aristotle entered European intellectual life." (Borrowman 2008, 354) Furthermore, Ibn Rushd contributed too extensively to the unfolding of the European Renaissance. For certain this holds for his influence upon Thomas Aquinas who, during his last years, "came into conflict [with] the standard-bearer of Latin Averroism in Paris [namely] Siger of Brabant". (Fakhri 2001, 140; Borrowman 2008, 354)

In 1270 the magisters working at the *Arts Faculty* of the *University of Paris* clashed with scholars of the *Theological Faculty*. Hence, bishop Tempier condemned 291 philosophical theses as erroneous in 1277: "some philosophers state things to be true according to philosophy, but not according to the Catholic faith, *as if there are two contrary truths* and as if there is truth in the sayings of pagans in hell that is opposed to the truth of Sacred Scripture." (Brozek 2010, 13) Raimundus Lullus accused Siger of Brabant and Boethius of Dacia of adhering a double-truth doctrine. However, Siger incontestably stated in *De anima intellective*: "in matter of doubt, we should adhere to faith which supersedes all human reason". (Brozek 2010, 23) So it is not only clear that there is only one Truth for Siger, i.e. theological truth, he also contradicts Ibn Rushd, excluding any contradictions between philosophy and religion. There are not even apparent inconsistencies, there is only rational, therefore philosophical blundering. Theology surpasses philosophy. "Siger nevers affirms there being one philosophical truth and the other revealed, nor that these truths could be contradictory". (Van Steenberghen 1977, 242) Nevertheless, Averroïsm, hence Ibn Rushd got associated with the double-truth doctrine, due to the misinterpretation by Tempier and the wrong accusations by Lullus. Siger was rightfully called an Averroist, not so because of the absurd incrimination, but because of his adherence to Aristotle's philosophy as

interpreted by Ibn Rushd. Thomas opposed to Siger's radical position in which science depended on religion, where Thomas actually defended the autonomy of science.

Is that not contradictory to *Philosophia ancilla theologiae* (philosophy serves theology) the dictum attributed to Thomas Aquinas? In a closer look these *verba* go back to Petrus Damiani (1007-1072, two hundred years before Aquinas). Damiani wanted to silence philosophy by giving it a distinctively subservient role. (Maritain 1955 IV§15) The *depositum fidei* (truths of faith) learn more about the world than philosophy (or other sources of knowledge) can. Thomas, indeed, adopted the adage, but asserted that (natural) philosophy is an autonomous discipline and, in that capacity, could serve theology more advantageously. (Willemsen 2015 34-35) Philosophy is to be regarded as an instrument "in order to establish conclusions which are not philosophic but theological". 'Ancilla', but not 'serva'. (Maritain 1955 IV§15) Neo-Thomism goes even further: it holds that ecclesial dogmatic formulas could change both in interpretation and in content (Mettepenningen, 2010, 20), most probably to be compatible with science. This totally agrees with Ibn Rushd' position, claiming that the interpretation of holy texts changes depending on demonstration. Theology has to follow (natural) philosophy. However, to Lemaître looking for *compatibility* is irrelevant because theology and science have different scopes. Indirectly Ibn Rushd seems to have influenced Lemaître through Thomas and consequently neo-Thomism.

## Ibn Rushd and Lemaître

Suitable frameworks to make a comparison between both approaches of the relation between religion and philosophy/science are provided by Ian Barbour (2000) and Lieven Boeve (2006). Barbour distinguishes in his typology of relations: conflict, independence, dialogue and integration. Boeve (a theologian at the *Theological Faculty* of *the Catholic University Louvain*, and director-general of *Catholic Education Flanders*) speaks of harmony, conflict, difference, gap and dialogue.

For both scholars the conflict-model comes to the same: there is a rivalry between science and religion, both claiming to be the only way to reach the Truth. Boeve saw science and religion converge during medieval times: they were in *harmony*, both were presented "in one single synthesis". (Van Biezen 2014) After a period of *conflict*, due to the mechanisation of our western worldview, it was accepted that they are *different* and actually pertain to separate parts of reality — science regards nature, religion regards values. For some, they are now even completely separated from each other, in language, method and function that a conflict cannot arise. Barbour calls this state 'independence'. In that case there is an unbridgeable *gap* between the two, as Boeve describes it.

However, if both disciplines agree upon both concerning the same reality, they are compatible and a *dialogue* can emerge. Barbour calls this (a future phase) of integration: science and religion cooperate; both aim for a common framework to explain reality.

Ibn Rushd and Lemaître were both deeply religious. As a priest Lemaître was strongly attached to his faith and to the Church. He was a member of the sacerdotal fraternity 'The Friends of Jesus'. Ibn Rushd's Islamic faith is equally unquestionable. Lemaître and Ibn Rushd were philosophers-scientists —'natural philosophers' would be an expression adequate to both (of course, I am aware of the 700 years between them, a period that saw unprecedented methodological and philosophical changes). The Muslim philosopher and the Catholic priest claimed that there cannot be any contradiction between holy texts and natural philosophy (i.e. science), *if and only if* Quran respectively Bible are properly understood and conclusions about the world are reached following appropriate scientific methods and correct reasoning. Both maintained that there are at least two ways to true propositions about the world. According to both, science and religion are not in conflict, nor are they complementary; they merely differ methodologically and discursively. Natural philosophy nor science supersedes religious insights. However, natural philosophy (i.e. science) does exceed theology methodologically (as an approach to physical reality). It is theology that has to follow (natural) philosophy. Therefore, in conclusion, science and religion are *different* and *independent* in the cases of Ibn Rushd and Lemaître. It is rather *Theologia accommodat ad philosophiam* (theology adapts to philosophy) than *philosophia ancilla theologiae* (philosophy serves theology).

While Barbour and Boeve as outsiders hope for integration and dialogue, insiders like Ibn Rushd and Lemaître were quite comfortable with the idea that science and religion happily live *next to each other*. Still, there is a distinction between Ibn Rushd and Lemaître. The former sees a (unilateral) *dependence* (another category, not considered by Boeve nor Barbour) between religion and science, while the latter forbids any migration of ideas from science to religion, but not vice versa: he was clearly influenced by theology (i.c. neo-Thomism). I would call it (religious) 'injectivity' (a mathematical term). A *real* dialogue between science and religion is unwanted. Looking back at these case studies, both scholars would have been better off keeping science and religion apart. That, of course, is not realistic, even impossible. I partially agree with Van Biezen that, following Lemaître, "[…] we can say that both the religious and the non-religious are free in their metaphysical or religious interpretation and appreciation, as long as this interpretation and appreciation does not get mixed with the scientific work itself, that is to say, its methods, its theories, its results and its experiments." But there is more

to it. Sometimes science does *depend* on religion (Lemaître could not take away his faith) and religion does *depend* on science (Ibn Rushd gives science the prerogative). There is 'injectivity' by religion (in science) and there is 'dependence' of religion (to science).

## Acknowledgements

The *Center for Logic and Philosophy of Science* (Vrije Universiteit Brussel) paid for my participation at the *Conference 'Science & Religion'* in Athens (September 3-5, 2015), while my colleagues of the *Universiteit Antwerpen* took over my exams during. Thanks to Laila Yacout and Alaa Eldin Ayoub for helping me with some passages written in Arabic. Finally, I want to thank my wife Katty Elias for giving me the opportunity to go on conferences and write research papers during our free time.

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# 4. JUDAISM, ISLAM AND CHINA

# EVOLUTION OF JUDAIC ATTITUDES TO MODERN SCIENCE

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## Introduction

According to the Israeli historian Noah Efron (2007,7), "if one wishes to understand the relationship between Judaism and science, the first thing to grasp is that there is no such thing as Judaism and no such thing as science." He refers to the changing nature of both through the centuries and proceeds nonetheless to write a book titled *Judaism and science*. Straddling over two millennia, the book features on the cover the father of the A-bomb Robert Oppenheimer, a Jew who was not only uninterested in Judaism but was profoundly attracted to Hinduism, learning Sanskrit in order to read sacred texts in the original. Efron's book contains a fascinating social history of Jews in modern science, but the subject announced in its title is mentioned only once, in a footnote.

This lack of interest may have to do with the common confusion between Jews and Judaism, quite deliberate in Israel's Modern Hebrew: the word "*yahadut"* denotes both Jewry and Judaism. This confusion is rooted in the recent, albeit partial, transformation of Jewish identities from religious into ethnic and national ones. Expressions like "Jewish vote," "Jewish state" or "Jewish scientist" need not have any relationship with Judaism. The prolific American scholar Jacob Neusner (2002, 3) makes this distinction very clear:

If the Jews as a group grow few in numbers, the life of the religion, Judaism, may yet flourish among those that practice it. And if the Jews as a group grow numerous and influential, but do not practice Judaism or practice a religion other than Judaism, then the religion, Judaism, will lose its voice, even while the Jews as a group flourish.

Since this paper is concerned with Judaic, i.e. religious, attitudes to science, it considers views of a minority of Jews, who see Judaism as an imperative, or at least an important focus of their life. Most adherents of Judaism, just as most adherents of

Christianity and Islam, rarely dwell on their religious tradition's attitude to science. Thus the few who do consider such issues are mostly scientists and/or Judaic scholars. It is these Jews who produce the bulk of writings on Judaic attitudes to modern science. These attitudes relate to professionalized science, an activity that assumed its current contours in mid-19th century and expanded throughout most of the 20th century.

More often than not, works of this nature reflect a religious commitment of the author. Most scholars tackling this subject are observant Jews writing for other observant Jews. One of the best such works is an insightful overview by Shalom Rosenberg (2015), who offers a comprehensive typology of cognitive aspects of the interface between science and Judaism.

For purposes of this paper, Judaism means a normative religious system that defines human behaviour and worldview. Judaism, just as Islam, is a decentralized religion. It has no one recognized administrative or ideological authority but, rather, evolves within relatively independent communities. Therefore there can be no one "Jewish position on science" (or anything else for that matter), even though some authors use this infelicitous expression (Dodick and Shuchat 2014).

Secularization in Europe and North America has distanced a majority of Jews from normative Judaism, and most Jewish scientists, including most Nobel laureates, have been Jews by descent rather than religious observance. Since they do not see themselves bound by *halakha*, or Jewish law (be it observing the Sabbath, eating kosher food or studying Torah), they are essentially indifferent to the relationship between Judaism and science. Moreover, for some science became a new faith and a substitute for Judaism. Thus one reads about a prominent Jew in the 19th century Central Europe: "on the rare occasions when he appeared in the synagogue, instead of a prayer book he always had a book of natural science before him" (Efron 2007, 174). In Zionist ideology science was largely perceived as an argument in favour of a rupture with, and a rejection of religious tradition (Rabkin 2006).

## Fragmentation of Judaism

Since this paper deals with modern science, it is important to emphasize that Judaism in Europe and lands of European settlement has experienced, in the last two centuries, several serious splits that persist to this day. At the turn of the 19th century in Eastern Europe, Hasidism, a mystical and popular variety of Judaism, split off from (and was cast off by) the contemporaneous mainstream of a more cerebral and meritocratic bent. The split occasioned much acrimony, even though both trends remained within what is called today the *haredi* (ultraorthodox) fold. Early in the 19th century in Germany, where

most Jews were enthusiastic about Emancipation (i.e. the conferral of legal equality on Jewish citizens) and came to admire and embrace German culture, another split occurred: Reform Judaism was born. As its name suggests, the new movement modified ritual and Judaic law, trying to fit it better with the largely Protestant environment of Germany and, later, of the United States.

While barely recognized in Israel, Reform Judaism claimed more synagogue members than any other Jewish denomination in the United States at the turn of the 21st century.[1] Another split, this time in the United States, culminated with the emergence of Conservative Judaism at the turn of the 20th century, tracing a middle road between Orthodoxy and Reform. Several decades later, in the 1960s, under the influence of Rabbi Mordechai Kaplan there emerged another Judaic denomination, establishing Reconstructionist Judaism, which revised a number of important religious postulates. The turmoil of the 1960s brought to life, also in the United States, the then youth movements of Jewish Renewal. They emphasized spontaneity and spirituality, in a way harking back to original Hasidism but without the punctilious observance of Judaic commandments typical of haredi Jews. In the course of the 20th century, a growing engagement of orthodox Jews with modern society and culture gradually led to the emergence of the Modern Orthodox movement. Its Israeli version, *dati leumi,* or National Judaism, acquired a distinct identity and a distinct set of values, especially with respect to colonization and recourse to violence as means of ensuring the Zionists' control of territory.

This paper deals with different varieties of Orthodoxy since the other Jewish denominations appear to have embraced science without reservations of Judaic nature (Plaut 1962 and Bemporad 1970). For Orthodox Jewish scientists the challenge is to make sure that their work not only comply with Jewish law and belief but that it do not lead them to social assimilation and transgressions it may entail. This is a modern variant of the centuries old striving for a balance between commitment to Judaism and openness to the rest of the world, between parochialism and universalism. Judaic attitudes to science are part and parcel of the story of Judaic responses to modernization.

Among other issues, modernity spells out dissociation between human behaviour and nature, an estrangement that may be deemed indispensable for the practice of science, for keeping a distance between the researcher and the object of his or her research. Yet, Pentateuch and most other Judaic sources postulate a divinely mediated

[1] For analyses of the 2013 Pew Research survey on Jews in the United States see : http://www.pewforum.org/2015/08/26/a-portrait-of-american-orthodox-jews/

relationship between human behaviour and nature. Thus the land may "vomit" its inhabitants as a punishment for their transgressions or, conversely, reward their good actions with abundant harvest (Leviticus 18:28).

Autochthonous Jewish communities in Asia and Africa encountered modernity as an outside force in colonial or quasi-colonial contexts. Yet, they approached modernization in a more harmonious manner than their brethren of European descent (Zohar 2003). Communities remained largely united in spite of the ensuing diversity in the level of religious observance. Reform and other modern denominations of Judaism have gotten little if any traction outside Ashkenazi communities to this day. Tolerance and a sense of community prevailed, and it was only after these communities were uprooted from their countries and brought to Israel that some of these Jews joined the haredi world, while others abandoned much of Judaic practice while remaining traditional, not quite "secular", an East European concept alien to non-Ashkenazi traditions. Even then, however, most of them did not come to see science as a problem or a challenge, and the vast majority of those concerned with issues of Judaism and science are Ashkenazi Jews, i.e. Jews whose ancestors lived for centuries in Christian countries of Europe.

Professionalization of science occurred in most European countries in the course of the 19th century. This process was largely contemporaneous with Emancipation. Similarly, in the United States and the Soviet Union, science was undergoing rapid growth at the time when Jews were abandoning Judaic practice and embracing modernity while making of science an opportunity for social mobility.

## Points of Encounter

Judaic attitudes to science comprise a range of issues. Infeld (1991) offered a detailed survey of many of them. The best-known one is the issue of reconciling scientific views of cosmology and evolution with Biblical verses and certain statements in the Talmud. Yet, it gradually lost its relevance. Writing in 1983, Leo Levi (1983, 15), a prominent Orthodox scientist observed: "During the past decades, the illusion of conflict between science and religion has been fading…" Proceedings of an important orthodox conference titled "Engaging Modernity" (Sokol 1997) held in 1993 do not even list science in the subject index. To the extent that there exists tension between Judaism and science, it "resides less in what science and religion have to say about the world than in the conflicting conceptions of human rationality that they represent" (Fish 2007, 9). Scientific knowledge may have a direct bearing on the fundamental religious concept of free will, such as research suggesting genetic predisposition to homosexuality, which the

Bible places in the realm of moral choice and condemns as "abomination." Advances in neurosciences pose more general questions of biological determinism versus free choice (Berger and Shatz 2006).

Another issue is the use of science as a source of proof in the veracity of Torah and the scientific feasibility of the events it recounts. There are also attempts to show that all important scientific discoveries had been foretold in the Torah and, some argue, can be deduced from its text (*hakol ba)*, albeit this knowledge is unlikely to be accessible before messianic times (Slifkin 2001). A variant of this approach is the belief that important historical events had been also foretold in certain codes to be found in the Torah.[2]

On another plane, the question arises whether science is a Judaically legitimate or desirable way to make a living or less intellectually demanding pursuits should be preferred in order to free one's mind for the study of Torah. However, other Orthodox Jews argue that Torah commands them to engage in scientific pursuits in view of intrinsic rather than purely instrumental value of science. Finally, certain principles and values of Judaism have been used in defining boundaries of ethically acceptable research.

The above issues can be roughly divided in two categories: cognitive and social, even though the two may occasionally intersect. The first category addresses issues of content of research and of its influence on Judaic ethics. Social issues constitute one aspect of the interaction between Judaism and modernity: is it desirable to spend time on anything but Torah studies and to engage in modern society altogether, lest its more permissive norms and ideas corrupt proper behaviour?

Orthodox authorities are relatively less concerned with the content of science since they rely on non-literal interpretation of the written Torah characteristic of the oral tradition in Judaism. Biblical texts have been interpreted according to certain exegetical rules, often straying quite far from the apparent literal meaning. Examples abound. One of them shows how the oral tradition interprets allegorically the Biblical verses referring to instruments of war: the sword and the bow used by Jacob the
Patriarch against his enemies (Genesis 48:22) become prayer and supplication (Bereshit Rabbah 97:6): rabbis locate Jewish heroism in the house of study, not on the battlefield. Thus Judaic interpretations of canonical texts are remarkably diverse and different from the apparent literal sense all the while remaining attentive to the minute details of the original. Moreover, innovative interpretations of Biblical and Talmudic texts (*hiddush*) are highly valued among Judaic scholars: "… one gets the impression that the Bible's

[2] See: http://torah-codes.net/world-war.php; http://www.realbiblecodes.com/blog/; for codes forecasting an end of ISIS see : http://www.breakingisraelnews.com/42382/new-bible-codes-point-to-the-destruction-of-isis-by-2016-jewish-world/#yecjSykowVTilPI8.97

very sanctity is attested to by lavish abundance of *conflicting* readings to which it gives rise" (Fish 2007, 12). This opens up ample possibilities of harmonization of scientific data with Biblical verses.

Nor do miracles mentioned in the Bible should *prima facie* pose a problem. An authoritative text in the *Mishna* lists a finite number of miracles conceived at the dusk of Creation (such as the earth opening up and swallowing Korah for defying Moses) (Numbers 15-16), which strongly suggests that since that moment the order of the world follows the laws of nature and can no longer be expected to produce miracles (Pirke Avot, 5: 6). According to this view, miracles are finite and they cannot be reproduced. The laws of nature override all else. However, others believe that the growth of every blade of grace is a miracle brought about by continuous Divine intervention.

This breadth of rabbinic interpretations of Biblical verses has been instrumental in dealing with discrepancy between the literal reading of Torah and observation of nature. The tension between rabbinic authority and observation is well illustrated in the dispute, reported between Rabban Gamliel and Rabbi Joshua about the calendar (Mishna Rosh Hashana, 2: 8-9). The Egyptian-born Rabbi Saadia Gaon (882-942) argued that when the verse contradicts one's observation it should not be taken literally. The example, he gives is in Genesis 3:20 "And the man called his wife's name, Hawa (Eve) because she was the mother of all that live". Saadia Gaon comments that we know she was not the mother of oxen and donkeys. Therefore the term "all that live" must not be understood literally. This approach was further developed in the works of Moses Maimonides (1138-1204) who argued that in some cases non-literal such as metaphorical interpretations must be deemed mandatory (Rosenberg 2015, 107). A metaphor sheds light on the limitations of the scientific method in understanding the world: a physicist investigating the vibrations produced by a musician playing harp notices only scientific aspects of the process rather than its musical quality, which not only remains elusive to the scientific method but constitutes the essence and the purpose of playing harp (Dessauer 1924).

## Early Syntheses of Modern Science and Modern Judaism

One of the approaches to harmonizing scientific research and Judaic commitment is termed *Torah u-madda,* i.e. Torah and knowledge. Those who uphold this principle often argue, citing Judaic sources, that scientific research may in fact enhance religious faith, improve understanding of Torah and intensify the awe of God.

One major authority quoted in support of Judaic importance of science is the Lithuanian rabbi Eliyahu ben Shlomo Zalman, better known as the Vilna Gaon (1720-1797). One of his disciples, Rabbi Barukh of Sklov, quoted him in print during the Gaon's lifetime: "According to how much a man lacks knowledge of other wisdoms, correspondingly he will lack a hundred-fold of Torah wisdom" (Levi 1983). Gaon was interested in science and encouraged translations of scientific works into Hebrew. Moreover, he reportedly called on God-fearing Jews to embrace scientific knowledge and thus regain the respect of the larger society (Infeld 1991, 126). Over a century later these exhortations became the credo of many an observant Jewish scientist.

One of the first to conceptualize the relationship between Judaism and modern science was, perhaps, the foremost defender of Orthodox Judaism in 19th – century Europe Rabbi Dr Samson Raphael Hirsch (1808-1888). His approach became influential among Orthodox Jews in German-speaking countries and nowadays continues to inspire an important segment of observant Jews in North America, Europe and Israel. His dictum, *Torah im derekh-eretz,* (Torah and ambient culture) stipulated a natural harmony between traditional Judaism and modern culture, including science, and embodied the then popular idea that Judaism is a religion of reason. Variants of this approach took the appellation of *Torah u-madda*, Torah and wisdom, and *Torah va-daat,* Torah and knowledge.

Hirsch professed "a Judaism which does not separate itself from nature and history in its constant changes but affirms life and recognizes itself out of its relationship to life" (Lamm 1990, 12). Hirsch criticized East European Judaism for being "removed from life, estranged and strange to the world and to life." Conversely, he built an educational system giving a place of honour to German culture, including the then rapidly expanding science. Students of the rabbinical seminary established by his spiritual heirs were encouraged to attend the university and study "science for its own sake" (Lamm 1990, 116). A similar degree of openness to the sciences had been observed in Italy well before the 19th century (Ruderman 1995).

Hirsch, just as the Vilna Gaon before him, considered Torah and science to stem from the same primordial source of truth, which later assumed different cultural forms. Therefore, they could no more engage in dialogue or conflict than different parts of a body meant to cooperate and coordinate rather than "interact substantively, even as a sane and balanced person does not interact with or talk to himself."

The idea that Torah and science belong to different domains is not new (Rosenberg 2015). One facet of the difference is illustrated by the above-mentioned parable of a physicist's study of harp playing: his results are correct but incomplete and even

irrelevant for assessing musical beauty. Another one emphasizes the impossibility of the human intellect to arrive at a complete understanding of a divinely authored text. At best, one can approach it asymptotically. The Italian scholar Samuel David Luzzatto (1800–1865) offered another way of separating the domains by accentuating the non-cognitive, affective nature of religion and the centrality of sensory perception in science. Finally, Judaic mystics have argued, beginning at least with the Spanish-born cabbalist Abraham Abulafia (1240–1291+), that stories of creation are not meant to convey truth but to instil values and beliefs (Idel 1989, 86).

## Twentieth-Century Approaches

The influence of Hirsch's approach waned somewhat in the context of the generalized disappointment with rationality and science that affected Europe in the wake of World War I. In the 1920s there emerged in Weimar Germany "Reactionary Modernism" (Herf 1986) that accounted for a widespread support of the Nazis' new order among scientists and engineers. In the wake of Hitler's election, some Judaic scholars explicitly rejected Hirsch's ideas (Shapiro 2006-7), with observant Jews in Germany turning to the less worldly East European Jews, who used to be disdained as ignorant of modern culture, as a source of authentic Judaism. Some turned to Zionism, which enjoyed support from Nazi authorities but had attracted very few German Jews before 1933.

World War II profoundly undermined the admiration and respect for German culture that was an integral part of Hirsch's legacy. The specifically German aspect of *Torah im derekh-eretz* became deemphasized because Germany's Jewish community was decimated by Nazi genocide and its vestiges were relocated to New York. The new centre of Hirschian thought and practice came to be known as "Frankfurt on the Hudson" (Lowenstein 1989). The Yeshiva University in New York and the Bar-Ilan University near Tel-Aviv were founded on principles partly inspired by Rabbi Hirsch's legacy and both attract observant Jews in search of quality higher education. Even though Hirsch was hardly a Zionist, many of his followers embraced the ideology of National Judaism and are, at least partly, motivated by concerns about the need for the state of Israel to have a cadre of Judaically committed scientists (Lamm 1990, 53).

According to Rabbi Norman Lamm (1990, 147), one of the leaders of the Yeshiva University,

Nature, the world, must not be neglected, and it must be studied and explored as part of man's relationship with his Maker. But Torah, as more than a creation of God, but His very Word, ever remains supreme.

In his other writings Lamm emphasized that an eventual discovery of extra-

terrestrial life and cloning should in no way affect one's belief in God as the Creator, who uses natural developmental processes, including those in the theory of evolution. Nor, according to him, are God's attributes of immanence and providence threatened by such advances in science: "A God who can exercise providence over ten billion earthmen can do so for ten billion times that number throughout the universe" (quoted in: Shatz 2008-9, 215).

A frequently heard argument in favour of science draws on the writings of Maimonides who considered secular studies not only permissible but compulsory for committed Jews: "Hear the truth from whoever says it" (Kaplan 2002, 60). His modern interpreter and translator the Yemenite Israeli Rabbi Yosef Kapah (1917-2000) argued that if a Jew studies science in order to acquire a better understanding of God and His works, then scientific research becomes "the holy of holies" (Lamm 1990, 80). Adherents of *Torah u-madda* also argue, citing Judaic sources, that scientific research may in fact enhance religious faith, improve understanding of Torah and intensify the awe before God.

Rabbi Abraham Isaac Hacohen Kook (1865-1935), a mystic and a poet of Eastern European origin, was careful not to open the door to all scientific pursuits and was critical of the Hirschian approach well before the rise of Nazism. While for Hirsh Torah and science were involved in a static relationship, Kook saw them engaged in a dynamic interaction. For Hirsch mathematics could be used to solve problems of the Jewish calendar, while for Kook Torah would define for the scientist "how to shape his approach, his purpose, his significance in the world" (Lamm 1990, 133). Kook was enthusiastic about the foundation of the Hebrew University in Jerusalem, which he saw as another step towards messianic redemption. His quote on this occasion of the verse "For out of Zion shall go forth Torah, and the word of God from Jerusalem" (Isaiah 2:3; Micah 4:2) continues to provoke controversy (Zivotofsky 2009). Kook's intention to found a religious counterpart to the secular Hebrew University resulted in 1931 in the establishment of the Institute for the Research and Study of Talmud and Jewish Law, known as the Harry Fischel Institute, training Judaic scholars, rabbis and judges, rather than scientists.

Kook believed that "the sacred must be established on the foundation of the profane," and argued that secular knowledge must be the most advanced if it is to benefit the sacred (Lamm 1990, 128). This is why he was supportive of atheist Zionist settlers in Palestine, considering them "the white donkey on whom messiah would ride to Jerusalem," and then the secular Jews would cede the governance of the country to

religious ones.[3] He also expected that building up the Land of Israel would return these atheists to the Judaic fold. However, his influence on them did not materialize. He is better remembered as a prominent Judaic scholar and the spiritual forefather of National Judaism developed by his son into a potent political movement responsible for Zionist settlement of the territories conquered during the war in June 1967.

The question of Judaic desirability of scientific research continues to provoke lively debate about the relationship between Judaism and science (Schiller 1995-6). One such question is whether scientific research possesses an "intrinsic religious value" or simply facilitates the service of God, just like eating, drinking or sexual relations, which are explicitly mentioned as such in *Shulhan Arukh,* the most authoritative code of Jewish law. If scientific research possesses an intrinsic religious value then, unlike eating, its conduct does not require the intention of serving God. If it is only of instrumental value, then a proper intention is essential, just as in any other kind of activities that Hasidim call *avoda be-gashmiyut,* i.e. serving God by material means (as opposed to prayer). However, the lack of proper intention should not prevent an observant Jew from eating or taking a walk.

Another issue raised in the debate is on the border of the social and the cognitive, i.e. whether Torah can and must be complemented by other kinds of knowledge. If both are assumed to come from the same divine source, as adherents of *Torah u-madda* believe, then there can be no contradiction between the two kinds of knowledge. Thus they postulate that beyond apparent contradictions there exists "a larger truth", which humans, however, can only approach asymptotically.

Besides the idea that all knowledge stems from the same divine source, which would prevent the very emergence of contradictions between science and Judaism, at least two other arguments have been made. One postulates that Torah is eternal while scientific knowledge by its very nature is subject to change. The other suggests that while science poses questions of what and how, religious questions are those of good and evil. In other words, Torah should not be mistaken for a textbook of biology or cosmology. American biologist Rabbi Moshe Tendler (1994, 177) caustically observes:

There is never a conflict between science and Torah. If there is the appearance of conflict, it only due to one of three factors: ignorance of Torah principle, ignorance of scientific facts, or most commonly, ignorance of both.

[3] This concept raised controversy in Israel, particularly among secular Israelis, in the wake of the publication of a book on this subject (Rachlefsky 1998).

## Opposition and Mistrust

Positivism and scientism, more that scientific results per se, influenced many a European Jew in the 19th and 20th centuries and helped them abandon the faith and the practice of Judaism. This, in turn, engendered a degree of mistrust of science on the part of the more conservative circles gathered under the umbrella of Jewish orthodoxy in Eastern and Central Europe. Popular authors, inspired by positivism, often presented science as a superior source of objective and eternal truth. Major rabbinic authorities in Eastern and Central Europe were shocked by the massive defections of Jews from the fold and adopted a defensive attitude.

In the face of Enlightenment ideas gaining ground in Europe, Rabbi Nahman of Breslov (1772-1810) extolled the virtue of "innocent faith" and forbad "to dwell on philosophical inquiry, God forbid, and to study books of science, God forbid. Only the great righteous man [*saddiq*] is permitted to undertake the study of the seven [profane] sciences. For he who enters these sciences, God forbid, can stumble there" (Rosenberg 2015, 177). Sciences, he continues, "are extremely detrimental, like eating of the Tree of Knowledge, which literally brought death to the world. … The foreign philosophical sciences are sweet in the beginning, but their end is the way of death, just as it was said of the Tree of Knowledge: "The tree was good to eat and a delight to the eyes" (Genesis 3:6)." Later Hasidic rabbis would reluctantly recognize science but would consider their cognitive value insignificant compared to the study of Torah.

Haredi Jews, heirs to the East European tradition, consider Hirschian legacy a temporary concession (*horaat shaa*), which is no longer relevant, even though many of them continue to revere his memory (Klugman 1996). They may not object in principle to scientific knowledge but find scientific pursuits problematic. Concerned about the danger of heretical ideas, they consider scientific research at best as a waste of precious time that should be devoted to Talmudic studies. On the pillars of orthodoxy in Eastern Europe Moses Schreiber (aka *Hatam Sofer*, 1762-1839) did not prohibit reading about science but voiced the dictum "anything new is forbidden by the Torah." It is not surprising that he remained incredulous when told that stars were found to be bigger than the moon (Infeld 1991, 168).

Yeshivas in the Russian Empire resisted for a long time the government's pressure to open their curriculum to the Russian language, history and science. An important precedent often quoted in haredi sources is the decision of Rabbi Naftali Tzvi Yehuda Berlin (aka Netziv, 1816-1893), in the second half of the 19th century, to defy the Russian government and close down the famous Volozhin yeshiva (in today's Belarus) rather than allow teaching of secular subjects within its walls (Stampfer 2005). Yet,

Netziv was hardly an obscurantist: he found points of convergence between scientists and Torah students, "not in the confidence they feel about their findings, but, on the contrary, in their persistent distrust of the fruits of their efforts. … Science and Torah study are both on-going, open-ended exercises in epistemic humility; both consisting of creative yet humbly self-doubting cycles of relentless trial and imaginative error" (Fish 2007, 11). The decision could not be motivated by a fear of science, and may rather have reflected the fact that Haskala had already made inroads into the yeshiva, a process that yielded several secularized[4] intellectuals such as the icon of Zionist culture Haim Nahman Bialik (1873-1934).

Jews in the Russian Empire who flocked into secondary schools and universities in the 19th century usually left the fold. Therefore there was little concern among them about reconciling their thirst for science with Judaism. In Arab lands, some rabbis forbad attendance of the then spreading schools of the *Alliance israélite* even though most urbanized Jews ignored the ban while remaining within Jewish communities.

The spectre of mass disaffection of Jews from traditional Judaic practice has been the main cause of mistrust of science in haredi circles in the last two centuries. In this sense, a parallel may be drawn with the case of Galileo, which, in the popular belief, became a convincing example of a conflict between science and religion. In fact, the episode has less to do with attitudes to science than with the fact that the Church was then besieged by the Reformation, which "led astray" millions of Catholics across Europe. It is in this context that "the Galileo Affair" came to be interpreted in the 21st century (Numbers 2010).

There has been intensive debate as to whether exposure to scientific knowledge might constitute a "spiritual danger" that may lead Jews astray. Indeed, as already noticed, the massive defection from Judaism in the 19th and early 20th centuries, particularly in Europe, was motivated, or at least rationalized, in terms of adherence to the new faith in science, which, it was declared, contradicts and invalidates religious belief.[5] This faith in science was based on reading popular science and borrowing the concept of conflict between religion and science from their non-Jewish environment, much of it overtly anticlerical and antireligious. Some argue, that the massive defection

[4] The term "secular" in Modern Hebrew *hiloni,* acquired in Israel the more activist connotation of "anti-religious" or "atheist".

[5] Israeli Rabbi Adin Steinsaltz remarked that natural scientists are more likely to believe in God than their colleagues in the social sciences. This, according to him, suggests that it is not scientific knowledge but values and opinions that determine the degree of religiosity. An Israeli himself, he noticed that Modern Hebrew, developed by militant atheists at the turn of the 20th century, presents science as absolute value by calling Darwinism *torat darvin,* literally "Darwin's Torah". (Steinsaltz 1994). However, more recent data suggest that social scientists are more likely to believe in God than natural scientists (Ecklund, E. H. and Scheitle, C. P. 2007).

of the 19th and early 20th centuries might have been facilitated by the ignorance of modern science by most spiritual leaders of European Judaism who were thus unable to relate to the arguments of those tempted to abandon Judaic practice. They appear to have ignored the injunction made in the *Mishna* with respect to an important use of non-Jewish knowledge: "Know what to respond to an heretic."

This argument of "spiritual danger" began to lose weight as sociological studies showed that, since the second part of the 20th century, defections from Judaism have been motivated by appreciation of the hedonistic and permissive lifestyle and the concurrent disinclination to abide by the requirements of Jewish code of law, rather than by the difficulty of reconciling scientific knowledge with their religious belief. The decline of positivism and scientism certainly played an important role in this process.

Opposition to Jewish Enlightenment (*haskala*) was upmost on the mind of many haredi rabbis, and this strongly affected their attitude to science. Rabbi Eliyahu Dessler (1892-1953), a major figure of 20th-century haredi Judaism, begrudgingly authorized deserting Torah studies in order to make a living, but banned engaging in professional and scientific pursuits (Lamm 1990, 71). Whenever scientific knowledge was needed to resolve a question of Jewish law about a new technological reality, rabbis would consult engineers and scientists. Such questions would occasionally irritate Jewish scientists: "Imagine! In modern times like this, …, the only way they think that science might be interesting is because their ancient, medieval problems are being confounded slightly by some new phenomena" exasperated Richard Feynman, an American Nobel laureate in Physics (quoted in Efron 2007, 202). There were even admittedly atypical occurrences when Hasidic rabbis would even forbid recourse to modern medicine, which they considered based on "impure" sciences, or compare the study of science to adultery (Infeld 1991, 190-192).

Ambivalence with respect to science can be observed among the Lubavitch Hasidim, the haredi group by far the most active in outreach to non-observant Jews and to non-Jews alike. The Hasidim respect and even boast scientists in their midst, usually newcomers to their movement since the Lubavitch educational system ensures that few of their own children would be apt to pursue a scientific career. The Soviet-educated scientist Hermann Branover, who had joined the Lubavitch as an adult, embodied this paradox. Unlike his contemporaries Gerald Schroeder (1998) and Nathan Aviezer (1990), who harmonized cosmology and evolution with non-literal and non-chronological approaches to the story of creation, he took a literalist position on the Biblical account of creation and mobilized alternative scientific ideas to discredit the theory of evolution (Branover 1994). This approach reflects an earlier attempt by the

last Lubavitcher Rabbi to dismiss cosmological data as baseless and self-contradicting theories (Schneerson 1961).

By the 19th century more and more books published by Judaic scholars in Europe were embracing the Copernican system, some of whom explicitly stating that it does not contradict anything written in Torah (Brown 2013). However in 2003, a book on the Hebrew calendar by the Rabbi Benizri (2003) who served as minister of labour and social affairs in the Israeli governments affirmed, that the sun revolves around the earth.[6] This reflects the radicalization of haredim in both Israel and North America since the 1970s, who produce Judaic literature aiming to discredit scientific knowledge.

The theory of evolution is another contested issue among the haredi Jews (Cantor, J. and Swetlitz, M. 2006; Cherry S. 2003). Important Judaic authorities concurred that the theory of evolution is compatible with a firmly-based Torah faith (Carmell and Domb 1978, 11). Such luminaries as Hirsch, Kook and the Italian rabbi and cabbalist Eliyahu Benamozegh (1822-1900) expressly endorsed the theory of evolution and harmonized it with mainstream Judaic concepts (Dodick 2014). However, evolution is rarely taught in haredi schools. According to one of the most authoritative decisors of the 20th century Rabbi Moshe Feinstein (1895-1986), pages on evolution must be torn out of the textbook, lest the pupils see the offensive material and be contaminated by it (Feinstein 1982). This practice is routinely applied at *haredi* schools in North America, where biology is part of the basic curriculum imposed on religious schools. In Israel the haredi school system is exempt from such government intervention. This may be due not only to the influence of Christian fundamentalism but also to the fact that Darwinism had become one of the pillars of modern-day atheism. In the wake of the Scopes trial in 1925, Reform and Conservative movements pondered the issue of teaching Darwinian ideas and found them compatible with their understanding of Judaism Swtlitz and Cantor 2006).

An interesting controversy developed around the work of Nosson Slifkin, an orthodox rabbi who adopted the rationalist approach of Maimonides to such issues as the theory of evolution and the age of the Earth.[7] Moreover, Slifkin argued that scientific knowledge found in the Talmud reflects the level of understanding common during the period of its redaction and has therefore no eternal validity. This approach was hardly novel since many medieval scholars, not only Maimonides, had spelled it out in their

[6] While, as already mentioned, Arab Jews, like Rabbi Benizri who is of Moroccan ancestry, never developed an antagonism towards modern science, his attitude is indicative of the assimilation of some Sephardic rabbis to the dominant Ashkenazi haredi thought.

[7] A survey of materials related to the debate can be found in http://www.cross-currents.com/index.php?s=slifkin+ban and http://www.zootorah.com/controversy/

works, provoking acute controversies, with some books being prohibited and even burned.

Yet, Slifkin's books were banned by an impressive array of Judaic authorities in 2004 and 2005, who publicly declared them heretical. Major distributors of Judaica books in the United States promptly dropped the controversial books from their lists, and praise and all mention of the books was pulled from the websites of global Judaic outreach organizations such as Aish HaTorah. Posters denouncing the books were plastered on the walls of the haredi neighbourhoods in Israel, and a haredi newspaper put the news of the ban on its website. In response, the author changed the spelling of his first name from "Nosson" to the more Israeli "Natan," turned to self-publishing, and started a private Biblical Museum of Natural History near Jerusalem. He prefaced a reprinting of one of his books with a somewhat unusual warning:

This book was written for those who are committed to the tenets of Judaism, but also respect the modern scientific enterprise and are aware of its findings, and who are therefore disturbed by the challenges that are raised for their understanding of Torah. … Other people may not possess as extensive a background in the sciences and may dispute the validity of the modern scientific enterprise. They may therefore simply not be bothered by the questions discussed in this book, or they may have different ways of dealing with such conflicts. Such people are not the intended audience of this book and they are advised not to read it (Slifkin 2012, p. 2).

He even published a longer article "In defence of my opponents," arguing for mutual tolerance among haredi Jews espousing different worldviews: "Every community has the right to choose its own educational approach, and to select its own leaders who would make such decisions."[8] In fact, his books are controversial only for a part of the haredi public while followers of modern orthodoxy may even find them too timid. This episode shows profound divisions within Jewish orthodoxy often misrepresented as monolithic and univocal.

## Current Trends

Normative Judaism obviously depends on those who define those norms in each generation. In order to do so, these decisors must possess all requisite knowledge, including scientific knowledge, since quite a few questions nowadays are science-intensive, including a plethora of new medical methods. Moreover, science has become an important part of general culture, which must be understood by those who make decisions of Jewish law.

[8] http://www.zootorah.com/controversy/InDefenseOfMyOpponents.pdf

Yeshayahu Leibowitz (1903–1994), both a Judaic scholar, a scientist and a philosopher of science of the Hebrew University in Jerusalem, sharpened the separation between science and Judaism. He drew a distinction between modern science, relying on empirical results, and medieval science, which preoccupied Maimonides and other scholars. According to Leibowitz (1987), Maimonides reinforced the idea that Judaism is a system of precepts rather than solely of beliefs. At the same time, it was Maimonides who codified the Thirteen principles of faith, thereby turning Judaism into "a real religion," albeit as late as the 13th century (Atlan 2014, 132-138). Leibowitz, in turn, sharply distinguished Judaism from other religions in which beliefs figure more prominently.

Leibowitz's basic posture is: "God is the Cause or Creator of the world, but this is not a reason to worship Him. My decision to assume the yoke of the Torah and the precepts, that is, to accept the yoke of Heaven, is in no way contingent either upon the nature of the world, or upon the way in which it came into being, or even upon any knowledge about myself and my essence " (quoted in Rosenberg 2015, 130). This view has since been contested with passion: "Although science and faith (or religion) may be construed as separate, they in fact form a necessary unity—the unity that exists in the soul of the believing scientist" (quoted in Rosenberg 2015, 133).

An Association of Jewish Orthodox Scientists (AOJS) was organized soon after the end of World War II. It was an heir to the *Bund Jüdischer Akademiker* established in Germany in 1903 by disciples of Hirsh. The AOJS offered to provide social, spiritual and intellectual support through meetings and periodicals. Officially, it strove to: a) clarify the connection between science and Torah, b) consider the application of the principles of halakha in particular issues, c) provide an opportunity for education and interaction with professionals sharing a common interest, and d) provide guidance to orthodox Jewish students considering a career in science. At the turn of the 21st century, AOJS apparently drew closer to the haredi world, away from the worldview of Modern Orthodoxy.

The growing acceptance of diversity in Western societies has facilitated the entry of orthodox Jews into science. "The Torah Jew does not have to choose between science and Torah. He has already shown that it is possible successfully to bestride the two cultures" (Carmell and Domb 1978, 10). Indeed, there have been several points of compatibility between scientific and Jewish cultures (Rabkin and Robinson 1995). It is not only the growing self-assurance of observant Jews that facilitates this bicultural existence. The image and the authority of science have also undergone important changes. Determinism of the 19th century occasionally obliged religious Jews to resort to

faith in order to resolve apparent contradictions between claims of science and those of Jewish tradition. Thanks to the broad authority of works by Karl Popper and Thomas Kuhn science has lost the claim to provide objective and absolute knowledge. This reassured orthodox Jewish scientists, one of whom observed in 1978:

In this scientific climate the orthodox Jewish scientist fits in with little difficulty, and finds himself obliged to make fewer explanations than a generation ago. The theory of evolution, which issued its challenge in the 19th century, is now seen to have the same transitory nature as other scientific theories (Carmell and Domb 1978, 26).

To conclude, Judaic attitudes to science have undergone significant changes since the emergence of professional science in the 19th century Europe. The advent of the scientific revolution in the 20th century did not immediately change the image of science as a source of absolute truth. The change came gradually in the wake of World War II and was facilitated by the steady increase in the number of observant Jews, usually issued from the modern orthodox milieu, who chose to enter the scientific profession.

On the other hand, among the haredim, both in Israel and elsewhere, there occurred a turn towards mistrust of science and scientific education and a greater intolerance of scientific findings. While such groups rarely bothered to grapple with substantive issues of the science-religion interface, other haredim and the modern orthodox produced an abundance of books and articles about it.

By the end of the 20th century the emphasis shifted away from issues of harmonization and compatibility to those of scientific understanding of Biblical verses, Jewish law and religious belief (Goldberg 2001; Amar 1992). This happened in the context of the decline of scientism (and scientific reductionism) and of a greater awareness of cultural, social, political and other human aspects of scientific knowledge. The experience of the 20th century clearly showed the pitfalls of founding moral values on science (Rabkin and Mirskaya 2003).

While faith used to be associated with religion and reason with science, it is now no longer uncommon to discuss beliefs in science (Atlan 2014). It is no less significant that scientific expertise came to be applied to a variety of technological adaptations of Jewish law. In the early 21st century, the defensive radicalization of the haredim continued to protect their children from ideas they deemed heretical and did not equip them, particularly males, with the intellectual tools to relate to science, let alone becoming scientists. This contrasts with the pre-modern openness of classical Judaism to scientific arguments and appreciation of scientific knowledge and its producers.

The author acknowledges useful comments previous drafts of this paper received from Michael Kaplan, Ira Robinson as well as comments and questions posed in the

course of the presentation of this paper at the Kiev-Mohyla Academy in August 2015 and at the International Conference on Science and Religion held in Athens in September, 2015.

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# SCIENCE AND RELIGION FACT AND FICTION: RELIGION VERSUS OTTOMAN VARIOLATION

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Variolation was the term referring only to inoculation for the prevention of smallpox by transferring the live smallpox virus from person to person, using either drops of lymph fluid from a smallpox pustule or its powdered scab, inserted into a cut in the skin in the arm or leg of a healthy person, which gave the recipient a mild case of smallpox and guaranteed life-long immunity.[1] It represented the origin of immunology yet the practice tends to be overlooked historically. It was used until superseded from 1796 by inoculation using the fluid from cowpox pustules, called vaccination from *vacca*, Latin for cow. In recurring smallpox epidemics 30% of those affected died and many survivors had not only pockmarks but major disfigurements and one third of all cases of blindness were due to smallpox (Fenner 1988, 246). The 18th century the mortality in Europe was estimated at 400,000 annually (Behbehani 1983, 458) so there was a valid reason for great interest in a method to avoid the disease. The efforts of the medical faculty to establish variolation in England exemplifies conflict between science and religion in the 18th century.

Detailed descriptions of variolation in Constantinople were received by the Royal Society in London from two Greek medical practitioners, Dr Emanuel Timoni (1713) and Dr Jacob Pylarini (1716), and were both published in the journal *Philosophical Transactions of the Royal Society* in 1716, yet this did not result in a single experiment in England. Then in April 1721 a practical demonstration was witnessed by many physicians when Lady Mary Wortley Montagu, herself a survivor of smallpox, had her

[1] Variolation had several cognates: ingrafting and engrafting from horticulture; transference, transfusing, inoculation, infusing; buying the pox – this refers to pustule scabs bought from a sufferer usually to hold and use to have a mild case of smallpox.

three year-old daughter variolated. She did not regard this as an experiment because her son had been variolated successfully in 1718 when they resided in Constantinople, where her husband was British ambassador at the Porte. Now in London, where an epidemic currently raged, she recalled their embassy surgeon Charles Maitland, who had assisted an elderly Greek woman to variolate her son in Constantinople, after fully investigating the practice there (Maitland1722). Presciently, the British embassy chaplain in Constantinople, Rev. Crosse, had maintained that variolation was "an un-Christian operation and could only succeed with infidels" (Voltaire 1734).

The practical demonstration was of great interest to the medical faculty, some began to practice this preventative technique successfully. Religious opposition erupted, with xenophobic overtones, based on idiosyncratic citations from the Bible and the prevalent belief that illnesses were sent by God, often as a punishment, and a method of preventing illness was seen as usurping the Divine prerogative. Additionally, the fact that the practice came from a country with a different faith was regarded as an insult to the Christian religion. A major centre for controversy was St Andrews Church, Holborn, in London, where the Rev Edmond Massey's vitriolic sermons were preached, announcing that variolation had been introduced by the Devil:

> Disease are utterly unlawful to be inflicted by anyone who professes themselves Christians. Let the Atheist, the Scoffer, the Heathen and the Unbeliever inoculate and be inoculated. [Massey 1722]

He then printed copies of his sermon and distributed these to public ale houses, coffee houses, as well as to the newly fashionable tea houses such as Twinings where ladies could meet. These were the venues for pamphlet wars between theologians and the medical fraternity with antithetical quotations from the Bible. Originally there were four further areas of objection (legal, political, ethical and medical) which lost momentum; the initial medical reservations were assuaged with emerging evidence of efficacy: none of those variolated contracted smallpox even when purposely placed in proximity with smallpox patients. Other anti-Islamic pamphleteers were active:

> To bring armies of Africans and Troops of Mahometans, to prove it [variolation] lawful by their Success with it is like their proving the Religion of Mahomet as the true Religion, because propagated and maintained by the Sword and professed by great Numbers as it is supposed to have been introduced and practised by profest
>
> [sic] Enemies of the Cross of Christ and Infidels reject it as Scandalous to the Gospel of Jesus Christ. (Grainger 1721)

Religious opposition continued intermittently through the century, shown by further examples, despite individual efforts by bishops to promote the practice. Bishop

Isaac Maddox of Worcester (1697-1759) was variolated himself as an example to churchgoers and still found it necessary to preach a positive sermon in favour of the practice in 1752, from the same pulpit in London as that from which Rev Massey had denounced the practice in 1722. Yet only one year later the Rev Theodore Delafaye preached and published:

> The great Disposer of things has ordered every disease so as to be for the benefit of his
>
> creatures. The elimination of fear of punishment by death or disfigurement from small-
>
> pox leads to immorality. Inoculation is an indefensible Practice, unreasonable,
>
> unnatural, unlawful, uncertain and unnecessary. (Delafaye 1753:1754)

A further thirty years later in 1788 in Newcastle upon Tyne, following the deaths of 300 local children from smallpox and to allay the religious qualms of the population, the Commission for free variolation firmly turned the tables on the clerics, sending the following letter from the Dispensary to each one, 'By Order of the Committee':

> Inoculation being so evidently calculated to lessen human misery, and to preserve the lives of mankind, every undertaking to extend its use naturally claims the patronage of the Clergy. The Committee for promoting general inoculation have, therefore, taken the liberty of transmitting you the inclosed Address, requesting you will assist their endeavours, by removing vulgar prejudices, and by recommending so salutary a practice to the poor inhabitants under your care.[2]

The clergy were specifically instructed to visit every house to convince the parents, to make a list of children agreeing to be variolated gratis and to inform the poor not only of free medicines but also of a remuneration for the parents.

Science first retaliated in August 1721 when King George I, with permission from parliament, decided on the 'Royal Experiment', the first planned clinical experiment with variolation, performed on six condemned prisoners, who volunteered and were promised freedom if the result proved successful, which it did.[3] This was observed by many local physicians, surgeons and apothecaries and also Dr Mathias Boretius who was visiting from Königsberg and later published his account in German (Boretius 1723). The prisoners could be observed daily Secondly, the first statistics in England were then

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[2] Dispensary 1787. The Committee for Promoting General Inoculation. Newcastle upon Tyne and Gateshead. British Library. At the same time a report of the numbers variolated free the previous year and the list of benefactors including a clergyman was sent out.

[3] The letter granting King George prisoners for the experiment hoped that variolation would be carried on to perfection for the "Generall benefit of Mankind". There was no secrecy as the names and ages of the prisoners were publicised in *The Weekly Journal or Saturday Post* to inform the public and progress reported.

planned by Dr John Jurin, physician and Secretary of the Royal Society; by placing an advertisement in their journal annually for six years inviting doctors to send to him detailed accounts of their patients' variolations, which he published. The third scientific step was the establishment in 1746 of the unique Smallpox and Inoculation Hospital, as no hospital would admit infectious cases; from small beginnings in a tent it became a magnet for European physicians to observe and practise variolation, leading to wider transmission of the technique.

However, archival research shows that religious objections based on the Muslim use of variolation to prevent smallpox were entirely fictional: the Ottomans did not use variolation in the 18th century. Evidence from manuscripts clearly attests to this from resident European physicians, ambassadors, consuls and businessmen as well as from four authors who were Ottoman subjects, three of whose books were published in Europe but not translated into English. The first was the Greek Dr Jacob Pylarini, who practised in Constantinople and Smyrna (Izmir), writing 1715 in Latin: "Only the Turks, since they expect that fate decrees and judges, are less responsive, have constantly neglected this so far" (Pylarini 1716). [4] Dr Antoine Timony, a physician born and practising in Constantinople, was the son of Dr Emanuel Timoni and wrote regretfully:

As for the Turks, they have never been persuaded to infect their children with the smallpox, based on the false prejudice of predestination, that is to say, on the necessity to live or die at a time fixed and determined by the Supreme Being. What good is it, they say, to use inoculation? That appears to them so infallible that it is even an article in their law. (Timony 1762, 7)

He reinforced this with the comment, "Their prophet orders that if they are in an infected house they may not leave." [5] A similar observation was recorded among Ignatious de Mouradgea d'Ohsson's many volumes published in French nearly thirty years later in 1791 on every aspect of life and customs in the Ottoman Empire where he was Chargé d'Affaires at the court of Constantinople:

It is due to a continuance of these prejudices that the ravages of smallpox are perpetuated in the country. In all families the parents meticulously inoculate their children. This practice, so wise … has only been adopted in the realms of the Grand

[4] My translation of "Soli Turcae, utpote Fati decretis addicti minusque dociles, hanc neglexerunt hucusque". Pylarini, J (1716) Nova et tuta Variolis exitandi per Transplantionem Methodus, nuper inventa et in usum tracta*. Philosphical Transactions of the Royal Society* 29, 394.
[5] My translations. Timony, A (1762) *Dissertation de la Petite Vérole,*7,8.

Vizier by Christian subjects. Fatalism and the ignorance that supports it are still the source of many other calamities for the Ottomans. (De Mouradgea d'Ohsson 1791) [6]

Further confirmation that variolation was not a Muslim practice came from Pasha 1, first physician to Sultan Abdul Mejid Khan (1839-1861) who wrote in 1846 *Menafiu'l-etfal* (*Benefits for Children)* in his history of smallpox in Turkey the confirmation that variolation was used in the 18th century by "Everyone apart from the Turks".[7]

This raises the question: who did use variolation in the Ottoman Empire in the 18th century? The fact was the four major ethnic and religious groups who lived in separate 'millets' did so; since 1679 millets were prescribed areas outside central Constantinople because non-Muslims were not permitted to live within 100 paces of any of the many mosques. However, there was religious freedom during the 18th century for the Greek Orthodox, Roman Catholic Armenians, Jews and 'Franks', the latter name given to the international community of foreigners who were resident merchants and diplomats, their designated accommodation situated across the Golden Horn in Pera and Galata.

As variolation was endorsed almost exclusively by the Christian community and also practised in the Jewish millet, why was it perceived in England as a Muslim practice? There was incorrect but commonly used reference to 'Turkey' rather than to the Ottoman Empire. It was due to the Eurocentric continued reference to 'Turks' that the word became synonymous with 'Muslims', even the late 18th century historian William Woodville did so in *The History of the Inoculation of the Small-Pox in Great Britain* (1796). West, central and east Europeans referred to the 'Turkish Empire' in speech and literature, "Turk was a kind of shorthand for referring to Muslims of every sort." (Quataert 2000, 173). Pertinently, Ottomans never designated themselves as Turks. (Moulin 2001, 30). Many descriptions of the technique noted that incisions were often placed to indicate the form of a cross in order to ensure success (Pylarini 1715; Kennedy 1715; le Duc 1722). That would not conceivably have been acceptable to Muslim families.

The immediate result of this misapprehension in England was that the religious rhetoric restricted variolation, the first scientific practice of immunity, and resulted in the death of those Christian followers who had no protection from the frequently recurring epidemics of smallpox. The lingering effect of the misapprehension is the

[6] My translation. De Mouradgea d'Ohsson, I (1791) *Tableau Générale de l'Empire Ottoman* 4:394-5. This book and Timony's, which criticised the Ottomans and the Sultan for not implementing variolation, were published outside Turkey.

[7] The manuscript Kitap 544 was retrieved for me by Dr Burhan Akgün, Cerrahpaşa Tip Fakültesi, Istanbul and translated by Ozlem Olgunkiyici.

perpetuation of the belief by many historians that variolation was also a practice of the Muslims in the Ottoman Empire in the 18th century, despite cogent evidence that it was exclusively a practice of all other ethnic communities. Variolation was rejected by Muslims due to their religious belief in Predestination, which made practices to avoid misfortune pointless. Quixotically this also represented a conflict between religion and science within the Ottoman Empire.

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# THE JESIUTS RELIGIOUS FACTORS OF THE CHINESE CALENDARS IN THE FIRST CENTURY OF THE QING DYNASTY (1644-1911)

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## 1. Introduction of the Chinese Calendars in the Early Period of the Qing Dynasty

In the second year of Chongzhen Emperor (1629), astronomical solar eclipse had not been predicted correctly by the Qintianjian (Royal Observatory), and the Ministry of Rites of the Ming dynasty presented a memorial of repairing the calendar, which was approved by the Emperor. Xu Guangqi (1562-1633), Li Zhizao (1565-1630), Li Tianjing (1579-1659) and Jesuits Nicolas Longobardi (Long Huamin, 1559-1654), Jean Terrenz (Deng Yuhan, 1576-1630), Jacques Rho (Luo Yagu, 1593-1638), Johann Adam Schall von Bell (Tang Ruwang, 1591-1666) and some Chinese astronomers had advanced wave upon wave on the reformation and compilation of the new calendrical books. In the end the seventh year of Chongzheng Emperor (1634), the Books, was called *Chongzhen Lishu*, *Chongzhen reign-period Treatise on Calendrical Science*, first form of the Jesuit astronomical encyclopedia, classified in five times and a total of 46 species of 137 volumes, had been presented to the Emperor for his deliberation and decision. Today, this original version of the Books is no longer a full, scattered at home and abroad. [1]

In the second year of Shunzhi Emperor (1645) of Qing Dnasty, Johann Adam Schall von Bell present a revised version of *Chongzhen Lishu* in new title *Xiyang Xinfa Lishu*, *Treatise on Calendrical Science according to the Western Method*, of 32 species of 103 volumes to the Emperor. Then the official almanacs of Chinese traditions, based on the calendrical books, had been put into use. In 1781, *Xiyang Xinfa Lishu*, was renamed as *Xinfa Suanshu*, *Mathematical Treatise accoding to the new Method*, in order to respect the

Qinglong Emperor's styled mame *Hongli* and compiled into *Qinding Siku Quanshu*, *Complete Books in Four Treasuries Royally Determined*. All the above-mentioned Treatises select the year of 1628 as the epoch of the Calendar and give the astronomical parameters for 200 years from 1628 to 1827, though some main parameters for the solar motion had been slightly revised from *Chongzhen Lishu* to *Xiyang Xinfa Lishu*. [2]

In 1678, *Kangxi Yongnian Lifa*, *Eternal Calendrical Method for the Kangxi Emperor*, compiled by Ferdinand Verbiest (Nan Huairen, 1623-1688), gives the astronomical parameters from 1828 to 3827 in 32 volumes, every 4 volumes for the Sun, the Moon, Five Planets (Saturn, Jupiter, Mars, Venus and Mercury) and the Eclipse. [3]

Y*uzhi Lixiang Kaocheng*, *Through Investigation of Calendrical Astronomy Imperially Composed*, was issued in the second year of Yongzheng Emperor (1724) in 3 parts of 42 volumes and normally called as *Jiazi Yuanli*, which selected the year of 1684 as the epoch of the Calendar and gave the astronomical parameters for 300 years from 1684 to 1983. [4]

In the seventh year of Qianlong Emperor (1742), *Yuzhi Lixiang Kaocheng Houbian***,** *Supplement to Through Investigation of Calendrical Astronomy Imperially Composed*, was compiled by Ignatius Kögler (Dai Jinxian, 1680-1746), André Pereira (Xu Maode, 1689-1743), issued in 10 volumes and normally called as *Guimao Yuanli*, which selected the year of 1723 as the epoch of the Calendar and gave the astronomical parameters for 300 years from 1723 to 2022.[5]

Therefore, from 1645 to 1742, the four calendrical books, *Xiyang Xinfa Lishu*, *Kangxi Yongnian Lifa*, Y*uzhi Lixiang Kaocheng* and *Yuzhi Lixiang Kaocheng Houbian***,** which are abbreviated as *XFSS*, *KXYNLF*, *LXKC*, *LXKCHB*, had been put into use in succession. All the almanacs in the Qing Dynasty had been imperially given a general name, *Shixian Li*, which included *Jiazi Yuanli* and *Guimao Yuanli*. (See Table 1)

**Table 1 The Jesiuts and the Chinese Calendars in the Early Period of the Qing Dynasty**

| Titles | Year | Jesiuts | Contents | Tables' Tenure |
|---|---|---|---|---|
| *XFSS* | 1645 | Nicolas Longobardi,<br>Jean Terrenz,<br>Jacques Rho,<br>Schall von Bell | More than 100 vols<br>Calendeical Introduction[1] (24 vols)<br>Tables (28 vols)<br>Others | 1628-1827;<br>0h of 22 Dec. 1627 (*Dongzhi Zizheng*) is the epoch. |
| *KXYNLF* | 1678 | Ferdinand Verbiest | Tables (32 vols)<br>(per 4 vols for the Sun, the Moon, the Five Planets and the Eclipse) | 1828-3827 |
| *LXKC* | 1725 | | 42 vols<br>Calendrical Theories[1] (16 vols)<br>Calculating Programme[2](10 vols)<br>Tables (16 vols) | 1684-1983;<br>0h of 21 Dec. 1683 is the epoch. |
| *LXKCHB* | 1742 | Ignatius Kögler,<br>André Pereira | 10 vols<br>Mathematical Principles[1] (3 vols)<br>Calculating Programme[2] (4 vols)<br>Tables (3 vols) | 1723-2022;<br>0h of 22 Dec. 1722 is the epoch. |

1) Chinese characters *Li Zhi* in *XYXFLS* is translated as Calenderical Introduction (to), *Li Li* in *LXKC* as Calenderical Theory (for), and *Shu Li* in *LXKCHB* as Mathematical Principles (of).

2) *Li Fa* in *LXKC* and *Bu Fa* in *LXKCHB* are translated as Calculating Programme.

The characters of the leap year, the astronomical parameters and the equations of the motion of the Sun and the Moon in the four imperial calendars, could be regarded as a definitive monograph on the calendrical science in the early period of the Qing Dnasty.

## 2 The Characters of the Leap Years of Calendrical Treaties in *XFSS*, *KXYNLF*, *LXKC* and *LXKCHB*

Having based upon Liyuan Hou Erbai Hengnian Biao of Richan Biao Juan Yi, Volume 1 of the Solar Tables in *Chongzhen Lishu*, which is abbreviated as *CZLS*, and that of Richan Biao, Juan Ershiwu, Volume 25 in *Xinfa Suanshu*, which is abbreviated as *XFSS*, Jiaoshi Juan Yi, Er, San and Si, Volumes 1, 2, 3, 4, in *KXYNLF*, Taiyang Niangeng Biao of Richao Biao in *LXKC* and Taiyang Niangeng Biao of Richao Biao in *LXKCHB*, the leap years, which are related the tropical year, in the four calendrical Books have been outlined as Table 2 and Table 3.

**Table 2 The Leap Year in *XFSS*, 1628-1827, in *KXYNLF*, 1828-, and in *LXKC*, 1684-1983**

1644*[1)] 1677 1710 1743 1776 1809 1842 1875 1908 1941 1974

48 81 14 47 80 13 46 79 12 45 78

52 1685 18 51 84 17 50 83 16 49 82[4)]

56 89 22 55 88 21 54 87 20 53 86

60 93 26 59 92 25[2)] 58 91 24 57 90

1631 64 1697 30 63 96 29[3)] 62 95 1929* 1962* 1995*

35 68 1701 34 67 1801* 1834* 1867* 1900* 33 66 99

1639 1673* 1706* 1739* 1772* 05 38 71 04 37 70 2003

1) The leap years with * are of 4 years interval from the former leap year, and the others with 3 years.

2) For *XFSS* 200 years from 1628 to 1827

3) For *KXYNLF* 2000 years (1828-3827), based on the 4 volumes of the Ecliptic Tables

4) For *LXKC* 300 years from 1684 to 1983

**Table 3 The Leap Year in *LXKCHB*, 1723-2022**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1743 | 1776 | 1809 | 1842 | 1875 | 1908 | 1941 | 1974 | 2007 |
| 47 | 80 | 13 | 46 | 79 | 12 | 45 | 78 | 11 |
| 51 | 84 | 17 | 50 | 83 | 16 | 49 | 82 | 15 |
| 55 | 88 | 21 | 54 | 87 | 20 | 53 | 86 | 2019 |
| 1726 | 59 | 92 | 25 | 58 | 91 | 24 | 57 | 90 |
| 30 | 63 | 1796 | 29 | 62 | 95 | 28 | 61 | 94 |
| 34 | 67 | 1800 | 33 | 67 | 1899 | 32 | 65 | 1998 |
| 1739* | 1772* | 1805* | 1838* | 1871* | 1904* | 1937* | 1970* | 2003* |

Therefore, the leap years, being intercalated in *XFSS* and successively in *KXYNLF* have been duplicated in *LXKC*. *LXKCHB* is based on the 33-year pattern of leap years (there is a rather exact accord between days and years over this interval, with eight days being intercalated per 33 years). 1900 in *KXYNLF* and *LXKC*, and 1800 in *LXKCHB*, are selected as the leap year. So, the characters of the leap years in the four calendars are different from that of the Gregorian Calendar and regarded as uniquely Chinese creations by the Jesuits and the Chinese astronomers in the 17th and 18th centuries. [6, 7]

## 3 The Astronomical Parameters in *XFSS*, *LXKC* and *LXKCHB*

The development of the Chinese calendars in the early period of the Qing Dynasty has been divided into two stages, based on the characters of the leap years in *XFSS*, *KXYNLF*, *LXKC* and *LXKCHB*. In the first stage, Tycho Brahe's theory, slightly revised by his successors, had been introduced into China by the Jesiut astronomers, was put in a position "made by imperial order" and gradually accepted by a great many Chinese famous scholars, who gave up the traditional algebraic method and turned to the Western geometric method.[8, p.424]

In 1683, *Jiaoshi Lishu*, *The Calendrical Book of Eclipses*, [9] compiled by Ferdinand Verbiest and was of historic significance in the development of the Chinese Calendars from *XFSS* to *LXKC*, has not been meticulously investigated upon to now, and even not mentioned in the Volume 3 of *Science and Civilization in China* (Cambridge, at the University Press, 1959) and the Volume of Astronomy of *the History of Science and Technology in China* (Beijing, Science Press, 2003).[10, 11] *The Calendrical Book of*

*Eclipses* was composed of *Huangdao Jiushidu Biao*, *Tables of Ninety Degrees of the Ecliptic*, and *Taiyang Gaodu Biao*, *Tables of the Solar Latitude*, though both of them are of respective page numbers. *Tables of Ninety Degrees of the Ecliptic*, particularly named as *Shengjing Jiushidu Biao*, *Tables of Ninety Degrees for Shengjing* in *Qingshi Gao*, *the Miscellany on the History of the Qing Dynasty* and ordered by the imperial edict as *followed forever* (Yongyun Zunshou), has two parts, Huangdao Jiushidu Biao Tushuo, the Explanation through Diagrams, in three leaves, and the relative tables in six leaves. *Tables of the Solar Latitude* are of 11 leaves and not of any explanation. As examined, the Explanation through Diagrams only had revealed the main three calculating steps for the compilation of *Tables of Ninety Degrees of the Ecliptic* (Libiaofa zhiyao yi you san), and the eight methods are absolutely necessary. The obliquity of the Ecliptic of 23º32′ was applied in *Tables of Ninety Degrees of the Ecliptic* and otherwise the obliquity of the Ecliptic of 23º30′ (Er shi san du ban) was permuted in *Tables of the Solar Latitude*.

In the second stage, the theoretical models for the solar motion was " the simplified elliptic" and for the lunar motion was a slightly revision of the theory of the lunar motion in Isaac Newton's Principia.[12] (see Tables 4 and Table 5) The Moon's greatest distance from the Earth, the parallaxes of the Moon and the apparent diameters of the Moon given by Claudius Ptolemaeus (c.90-168) Nicolaus Copernicus (1473-1543), Tycho Brahe (1546-1601), *Yuzhi Lixiang Kaocheng* and Johannes Kepler (1571-1630) were tabulated. [13, 14, 15] (See table 6)

**Table 4 The Astronomical Parameters in *XFSS*, *LXKC* and *LXKCHB***

| Titles | *XFSS* | *LXKC* | *LXKCHB* | Chinese terms |
|---|---|---|---|---|
| Epoch | 0h of 22 Dec. 162 | 0h of 21 Dec. 168 | 0h of 22 Dec. 1722 | 历元 |
| Tropical Year | 365.2421875 | 365.2421875 | 365.24233442 | 岁实 |
| Synodic Month | 29.530592 | 29.530593 | 29.53059053 | 朔策 |
| Average Motion | | | | |
| Sun | 3548″.33050925 | 3548″.3305169 | 3548″.3290897 | 太阳平行 |
| Moon | 47435″.0227776 | 47435″.021177 | 47435″.0234086 | 太阴平行 |
| Perigee | 0″.1219338 | 0″.167469 | 0″.17248 | 最卑平行 |
| Node | 190″.63333 | 190″.64 | 190″.63863 | 正交平行 |
| Apogee | 401″.00 | 401″.077477 | 401″.070226 | 最高平行 |
| Eclip. Obliquity | 23°31′30″ | 23°29′30″ | 23°29′ | 黄赤大距 |
| Angle to Eclip. | | | | 黄白大距 |
| | | 5°17′30″ | 5°17′20″ | |
| | 4°58′30″ | 4°58′30″ | 4°59′35″ | |
| Solar Eqn. | | | | |
| of Centre | 2°03′13″ | 2°03′11″ | 1°56′13″ | 初均最大值 |
| Lunar Eqn. | | | | |
| of Centre | | 7°33′03″/ | 7°39′33″/ | |
| | 4°58′27″ | 4°58′28″ | 4°57′53″ | 初均最大、最小 |
| Eccy in 106 | | | | |
| Sun | 179200 | 179208 | 169000 | |
| Moon | Dist. bet. the Earth and the Moon 10 | | | |
| epicycle | 580000 | 580000 | | 本轮 |
| oblique circle | 290000 | 290000 | | 均轮 |
| sub-epicycle | 217000 | 217000 | | 次轮 |
| sub-obl. cir. | 117500 | 117500 | | 次均轮 |
| Eccy in 106 | | | 667820/433190 | 最大、最小两心 |
| Harrox-wheel | | | | (偏心率×107) |
| size in 106 | | | 550505 | 最高本轮半径 |
| | | | ±117315 | ±最高均轮半径 |
| 2nd Epicycle | | | 57′.5/1′.5 | 正交本轮均轮半 |

**Table 5 The Parameters of the Sun and the Moon in Isaac Newton's *the Theory of Moon's Motion* (1702, TMM), the second edition and the third edition of *Principia*, and *LXKCHB***

| Titles | TMM (1702) | *Pricipia*(1713) | *Pricipia*(1726) | *LXKCHB* (1742) | Chinese terms |
|---|---|---|---|---|---|
| Annual Eqn. | | | | | |
| Sun | 1°56′20″ | 1°56′26″ | 1°56′20″ | 1°56′13″ | 太阳最大均数 |
| Moon | 11′49″ | 11′52″ | 11′51″ | 11′50″ | 太阴最大一平均 |
| Apogee | 20′00″ | 19′52″ | 19′43″ | 19′56″ | 最高最大平均 |
| Node | -9′30″ | -9′27″ | -9′24″ | -9′30″ | 正交最大平均 |
| Eqn.2* | 3′56″/3′34″ | Same | Same | 3′56″/3′34″ | 太阴最大二平均 |
| Eqn.3* | 47″ | 49″/45″ | 47″ | 47″ | 太阴最大三平均 |
| Lunar Eqn. | 7°39′30″/ | | | 7°39′33″/ | |
| of Centre | 4°57′56″ | | | 4°57′53″ | 初均最大、最小值 |
| Eqn of Apogee | 12°15′04″ | 12°18′00″ | Same | 12°18′16″ | 最高均 |
| Ecc$^{y}$ in $10^6$ | 66782/43319 | 66777/43323 | Same | 667820/433190 | 最大、最小两心差 |
| Harrox-wheel | | | | | (偏心率×$10^7$) |
| size in $10^6$ | 55050 | 55050 | Same | 550505 | 最高本轮半径 |
| | ±11732 | ±11727 | | ±117315 | ±最高均轮半径 |
| 2$^{nd}$ Epicycle | — | ±352 | | 57′.5/1′.5 | 正交本轮、均轮半 |
| Eqn.5 | 37′25″/33′40″ | 37′11″/33′14″ | Same | 37′11″/33′14″ | 太阴最大二均 |
| Eqn.6* | 2′10″ | -2′25″ | Same | -2′25″ | 三均 |
| Eqn.7* | 2′20″ | 1~2′ | Omitted | 3′00″ | 末均 |
| Angle to Eclip. | | | | | |
| Maximum | 5°17′20″ | | | 5°17′20″ | 最大黄白大距 |
| Minimum | 4°59′35″ | | | 4°59′35″ | 最小黄白大距 |

* These equations of the motion of the Moon were originally created by Isaac Newton.

**Table 6 The Moon's greatest distance from the Earth, the parallaxes of the Moon and the apparent diameters of the Moon given by Claudius Ptolemaeus, Nicolaus Copernicus, Tycho Brahe, *Lixiang Kaocheng* and Johannes Kepler**

(Greatest distance) Pto/ Cop/ Tyc/ *LXKC* (parallaxes) Pto/ Cop/ Tyc/ *LXKC*

(apparent diameters) Pto/ Cop/ Tyc/ *LXKC* / Kepler

The greatest [altitudinal] elongation of the half moon

64ᴾ09′/ 68ᴾ21′/ 60ᴾ36′/ **61.98ᴾ** 0º54′/ 50′19″/ 57′44″/ 55′27″

0º29′/ 27′40″/ / (29′49″) / 29′30″

The greatest distance from the Earth at new moon and full moon

53ᴾ50′/ 65ᴾ30′/ 58ᴾ08′/ **58.16ᴾ** 1º58′/ 52′24″/ 59′09″/ (59′06″)

32′08″/ 30′10″/ 30′30″/ **31′47″**/ 31′12″

The distance of the center of the epicycle from the Earth

48ᴾ51′/ 60ᴾ19′/ 56ᴾ50′/ **56.72ᴾ** 1º01′/ 58′25″/ 60′51″/ (60′36″)

38′42″/ 32′44″/ 32′34″/ (32′35″)/

The least distance from the Earth at new moon and full moon

43ᴾ51′/ 55ᴾ08′/ 54ᴾ50′/ **54.84ᴾ** 1º04′/ 62′21″/ 62′39″/ (62′41″)

38′08″/ 35′40″/ 34′40″/ **33′42″**/ 32′

The Least [altitudinal] elongation of the half moon

33ᴾ33′/ 52ᴾ17′/ 52ᴾ14′/ **53.71ᴾ** 1º24′/ 65′44″/ 65′36″/ 64′51″

55′ / 36′08″/ / (34′52″)/ 34′18″

The difference between the greatest and the least elongations of the half moon

30ᴾ37′/ 16ᴾ/ 8ᴾ/ 9ᴾ 0º30′/ 12′25″/ 8′53″/ 9′24″

## 4 Some discussions on the religious factors in the four imperial calendars

Having based the textual interpretation of the theories *XFSS*, *LXKC*, and *LXKCHB*, the following conclusions have been reached. The characters of leap years in *XFSS*, *KXYNLF*, and *LXKC* had a common continuity and the character in *LXKCHB* is rather different and has its own rule. The theories of the lunar motion in *XFSS* and *LXKC* have based on the model of epicycle- oblique circle- sub-epicycle- sub-oblique circles (Benlun- Junlun- Cilun- Cijunlun). The modern theory of the lunar motion, put forward in Isaac Newton's

1702 *Theory of the Moon's Motion* and the second edition of *Principia* (1713) was not introduced in *LXKC,* which was slightly revised and incorporated in *LXKCHB* (1742). The Moon's greatest distance from the Earth, the parallaxes of the Moon and the apparent diameters of the Moon in *Yuzhi Lixiang Kaocheng* were different from the values given by Claudius Ptolemaeus (c.90-168), Nicolaus Copernicus (1473-1543), Tycho Brahe (1546-1601), and Johannes Kepler (1571-1630), and the ratio of the diameter of Earth and the diameter of the Moon in *LXKC* is 3.72 and 1, which is different from the value of 3.5 and 1 given by Nicolaus Copernicus and appeared in *XFSS*. The theory of eclipse in *LXKC* was slightly different from that in *XFSS* and *KXYNLF*, and based on the horizontal coordinate system and the angle of intersection between the Moon's circle and the ecliptic.

As Dr. Joseph Needham pointed out in 1959, in the history of intercourse between civilizations there seems no parallel to the arrival in China in the 17th century of a group of Europeans so inspired by religious fervour as were the Jesuits, and at the same time so expert in most of those sciences which had developed with the Renaissance and the rise of capitalism. ([10], p. 437) And, all in all, the contribution of the Jesuits, chequered thouth it was, had qualities of noble adventure. If the bringing of the science and mathematics of Europe was for them a means to an end, it stands for all time nevertheless as example of cultural relations at the highest level between two civilizations theretofore sundered. Truly the Jesuits, with all their brilliance, were a strange mixture, for side by side with their science went a vivid faith in devils and exorcisms. Though some superstitions wilted in their presence, philosophers might opine that they brought as many with them. ([10], p. 457) So the time from the end of the Ming Dynasty to 1740s is recognized as The Time of the Jesuits.

The author gratefully acknowledge the support from K. C. Wong Education Foundation, Hong Kong, and National Science Foundation of China (NSFC), and in memory of Prof. Qian Linzhao (1906-1999) of University of Science and Technology of China (USTC) and Prof. D. T. Whiteside (1932-2008) of Cambridge University.

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