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PHYSICS AND RELIGION

AN INTRODUCTION ABOUT RELEVANCE AND NEUTRALITY¹

I. POSITIONS ON "SCIENCE AND RELIGION"

1. A brief history of relevance and separation

Superficially the history of the relation between science and religion might be structured as follows. In the Middle Ages religion and prescientific knowledge were integrated. The rise of modern science led to conflicts. This resulted in modern atheism as well as in religion withdrawing from the cognitive domain to apparently inaccessible realms such as ethics or feelings. This story will be sketched and nuanced here (I.1). The issue then seems to be in what way religion may have a chance again in the cognitive realm (section 2), or whether it should develop more in line with the insights which resulted in separation (section 3).

a. The medieval synthesis

A synthesis of religious convictions and (pre-)scientific insight seems to characterize the late Middle Ages. Prominent among the scientific insights were those of Aristotle, as mediated through Arabic culture. A major example of a theological system in coherence with the available knowledge was the work of Thomas Aquinas (13th century). However, the synthetic approach was not restricted to systematic theology. Fiction, like Dante's trilogy about heaven, hell, and purgatory illustrates the medieval quest for a worldview as well. Ideas taken from the Greek philosophers (Aristotle, Plato), from Holy Scripture and from the writings of the Church Fathers (e.g. Augustine [4th and 5th century]) were integrated.

Among the characteristics of the medieval synthesis were its static character, its hierarchical structure and geocentrism. The order, built upon Aristotle's

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doctrine of “natural place” was not understood as something merely factual; the order was also prescriptive. (As some uses of the word “natural” or “counter-natural” in our time still reflect). The order of the world was not something accidental, but reflected God’s order and providence.

b. The rise of the modern sciences and the Galileo affair:
relevance or neutrality?

Though some elements in the old synthesis were lost with the rise of modern science, especially its geocentrism (and thus its Aristotelian doctrine of “natural place”), at first most scientist argued more or less the same with respect to religion. The order of the world as science discovered it, was the order God had put into it. One could learn about God from the book of Scripture and from the book of Nature. It is misunderstanding that the beginning of modern science was marked by conflicts between science and religion, or between scientists and the Church. To make clear that the situation has been more complex, let me make a brief digression on the Galileo affair.²

The conflict that arose in the seventeenth century around Galileo has often been seen as a conflict between science and the Catholic Church, or even theology in general. However, the conflict reflected a conflict between two views of, and social contexts for, science. There was the scholastic tradition, appealing to previous authorities (Aristotle as ‘The Philosopher’) well established in the medieval universities. The new sciences arose in another setting, in combination with the trade and crafts in the cities which were gaining in importance. Whereas the then traditional approach equated knowledge and certainty, the new approach led to modern empirical science, ascribing a more provisional and probabilistic status to knowledge. The Galileo conflict may be seen as marked by a specific alliance between the medieval, scholastic tradition in knowledge and certain powerful elements in the Catholic church rather than as a straightforward conflict between conservative religion and progressive science.

The Galileo affair may also be described as a conflict between two views of religion, especially of the relevance of Scripture for science. In Galileo’s writings, especially in his *Letter to Grand Duchess Christina* (1615), two types of argument about the proper way of dealing with the relation between Scripture and natural science can be found.

² The analysis of Galileo’s use of Scripture (for which he appeals to Augustine) follows E. McMullin (1981). The socio-political element is more expounded by De Santillana (1955). Alliances may have been different from what we expect: “a major part of the Church intellectuals were on the side of Galileo” (XII). The conflict “reveals Galileo, like all free men, seeking support in established custom, credit, and tradition, while Urban VIII, like all organizers of power, becomes the unwitting tool of the streamlined, the ‘efficient’, and the new” (ibid., IX). Emphasis on substance, rather than power, is placed by J.J. Langford, who also discusses the two ways of dealing with Scripture (1966, e.g. 65ff).

Relevance. Firstly, if science has proven certain facts, one has to adapt one's interpretation of Scripture. However, if scientific knowledge is merely "plausible opinion and probable conjecture" in place of a sure and demonstrated knowledge, one would have to give priority to Scripture: "where human reasoning cannot reach — and where consequently we can have no science but only opinion and faith — it is necessary in piety to comply absolutely with the strict sense of Scripture". Thus, the information of Scripture is relevant to our view of the world and vice versa, but Scripture or science needs reinterpretation if a conflict arises. Which one needs reinterpretation depends on the certainty of the claims made by both sides. By the way, science may be open to reinterpretation in two ways. The substance itself may be interpreted differently. But the status of scientific statements may also be assessed differently. For example, Copernicus' book *De Revolutionibus Orbium Caelestium* (1543) had an anonymous preface (now known to have been from the Lutheran theologian Osiander) which emphasized that these ideas were no more than hypotheses, developed for simplifying calculations, and did not aspire to be true.

Neutrality. Secondly, however, Galileo also argues for the neutrality of Scripture in matters cosmological, and vice versa. The goal of Scripture was not to inform us "how the heavens go", but "how to go to heavens". The Bible is only relevant in matters "which concern salvation and the establishment of our Faith"

„Relevance" and "neutrality" are not consistent with each other. However, both lines are similar to contemporary positions, as described in sections 2 („Relevance") and section 3 („Neutrality"). Similar to the division between relevance and neutrality is the division between expansion and restriction. One could either argue for a restricted scope of science and of religion, thus allowing for their coexistence and mutual neutrality, or one could argue that they cover more or less the same issue (everything?), which implies relevance of the one for the other, either negatively (conflict) or positively (harmony).

c. Three attitudes

Over the centuries, following the rise of modern science, various positions developed, of which some assume "relevance", whereas take off from "neutrality".

Relevance: an antagonistic attitude, which defended the old view of the world, despite scientific discoveries proving the opposite. Such conflicts continue until our time, with "creationism" being its most well known contemporary manifestation. The reverse of this antagonistic attitude, rejecting science for religious reason, is the rejection of religion as a consequence of scientific discoveries. Characteristic titles in this context

have been A.D. White, *A History of the Warfare of Science with Theology in Christendom* (1896) and J.W. Draper, *History of the Conflict between Religion and Science* (1875). However, as a balanced view of history, this “warfare” model is far from the whole story.

Relevance: an adaptive and integrative attitude, taking up the new discoveries and arguing for the meaningfulness of religion in terms offered by the sciences. This may be exemplified by the English “arguments from design” tradition. If one were to find a complex item on the shore, and it turned out that that item could be interpreted as indicating the position of the Sun (a watch), it would be well defensible to argue that the item was designed for that purpose, rather than that the correlation was a mere accident. Similarly, so the argument goes, should one opt for intentional design of organisms, as their intricacy surpasses by far the intricacy of watches.

A separation of religion and science. The idea that religious convictions are neutral with respect to scientific ideas has continued to attract major thinkers over the centuries. One well known example is the philosopher Immanuel Kant, who discussed in his *Kritik der reinen Vernunft* (1781) the status and limitations of theoretical, scientific knowledge, whereas he introduced religion (God, soul, immortality) in the context of his *Kritik der praktischen Vernunft* (1788), his major work on ethics. The theologian Friedrich Schleiermacher (c. 1800) placed the feeling of absolute dependence at the core of religious life, thus incorporating the neutrality principle.

By the way, though much contemporary discussions focus more on the results of science, the emphasis on feeling or attitudes may also be a meeting ground for science and faith. For instance, the historian of science Olaf Pedersen has argued that, “when a scientist realizes the implications for one’s personal existence of the fundamental scientific experience, he has adopted a relationship towards the world which is essentially the same as that which the believer adopts when expressing belief in creation” (Pedersen 1988, 138). Science does not disclose God’s attributes. Rather, science and faith have to do with similar attitudes towards the world, say the feeling of joy and satisfaction at making contact with the reality, with relational structures for which we are not responsible though we may be able to recognize them as that reality which has been given to us.

As a more recent form of neutrality one might mention the philosopher Ludwig Wittgenstein, who in his later writings emphasized that the meaning of words is to be understood through their use. Thus, the meaning of the term “goal” may be clear in the context of football, but it is unintelligible in the context of chess. Various practices constitute various language games. Transferring concepts from one language game to another language game, say from religion to theoretical physics or vice versa, is considered as a misguided enterprise.

d. The rise of atheism

Concurrent with the development of the three positions mentioned above there is the rise of modern atheism.³ This has often been linked to the rise of science, though the development of historical consciousness (and its application to religious tradition) has been a major factor as well.

The rise of atheism is not only a consequence of conflict between science and theology (antagonism) or of the retreat of theology into some inaccessible realm (separation). The defense of christianity became based on philosophical argument or on evidence from the world. It seems to go without notice that specific religious elements were left out. One "will look in vain for the history of holiness as a perpetual manifestation of mystery, the testimony of the mystics, the depth of human religious practice over thousands of years, and — even more remarkable for a Christian culture — anything of the reality and meaning of Jesus of Nazareth. Religion either in its internal, intuitive, affective dimensions or its historical, institutional, external, traditional dimensions has nothing to offer to the question" (Buckley 1988, 94). Thus, the issue is also what the, mostly implicit, criteria are by which it is determined what would count as evidence. Turning to philosophy, and subsequently to physics, in search for a foundation for religious convictions may have been a betrayal of religion itself. "The origin of atheism in the intellectual culture of the West lies thus within the self-alienation of religion itself" (Buckley 1987, 363).

However, this is only one perspective on the history of science-and-religion. Whereas this perspective traces the problem of linking religion to the science of the day (seeking too much relevance), the historian Max Wildiers argues that the loss of plausibility for religion has risen as a consequence of the separation of religion and modern science, discovering insights which did not fit into the medieval worldview assumed in theology. Again, as in the preceding section, whereas one author emphasizes distinctiveness, another assumes the mutual relevance of science and religion.

³ It should be stressed that atheism is a term which is relative to theism, and often used for those who defend a different view of the divine rather than its non-existence. Akhenaton was accused of atheism when he introduced the worship of a single god in ancient Egypt, and Socrates was charged of atheism when he questioned beliefs about gods in ancient Greece. A discussion may be found in Buckley (1987, 1-36). He notes two influential books against "the atheists", by Leonard Lessius and Marin Mersenne, which appeared in the beginning of the seventeenth century. They brushed together various thinkers under this label. „Like witches, atheists were discerned everywhere, refuted, run to the earth, and put to death. The only problem is, it is not certain that they existed" (Buckley 1988, 91). The archetypal, selfconscious modern atheist seems to have emerged in the middle of the eighteenth century in France, for instance Baron Paul-Henri Thiry, Baron d'Holbach, author of *Système de la Nature, ou des Lois du monde physique et du monde moral* (1770), and Denis Diderot, the chief editor of the *Encyclopédie*.

2. Ideas, knowledge and valuation fundamental decisions

It is too easy to suggest that it is only the substance of knowledge regarding the world that separates us from the medieval synthesis. There are at least four different types of change that should be considered in reflection on the (ir)relevance of contemporary physics for theology.

Changes in substance of our ideas about the world are obvious. Most significant have been the loss of geocentrism, the longer time scales, and the evolutionary understanding of humanity in relation to the rest of the living world.

Changes in our view of knowledge have occurred as well. The subject acquired a more prominent place. In Descartes' famous phrase *Cogito ergo sum*, I think therefore I am, certainty was not located in the world outside him, as everything could be an illusion. Certainty was found in the reflection upon the process of thinking. The philosopher Kant understood the world as it is in itself, to be inaccessible; the accessible world is the world as we describe it in our categories. These categories, for instance Euclidean space, were thought to be necessarily the way they were. Though subsequent developments have shown this necessity to be mistaken, the insight still stands that knowledge is shaped by our categories and not just by the reality it intends to be about. The turn to the subject with his or her categories of thought is continued in our century with emphasis on the role of language and context. How much is our knowledge about the world (realism) and to what extent is it our construction, relevant in a specified practical context but not to be granted a more universal meaning aside of that context?

A third issue regards our appreciation of the world. The medieval synthesis took it for granted that the world reflected a divine order. Some continued this affirmative line, even if the order of nature itself was seen differently. As the poet Pope wrote for Newton's grave: "Nature and Nature's laws lay hid in night. God said, Let Newton be, and all was light". However, others felt that with the loss of the traditional order of the universe, all sense of order — whether natural or social — was crumbling down. An example is provided by a fragment of a poem by John Donne (1611; discussed by Toulmin 1990, 93-103).

And new philosophy calls all in doubt,
 The Element of fire is quit put out;
 The Sun is lost, an th'earth, and no mans wit
 Can well direct him where to look for it.
 And freely men confess that this world's spent,
 When in the Planets, and the Firmament
 They seek so many new; they see that this
 Is crumbles out again to his Atomies.
 Tis all in pieces, all coherence gone;
 All just supply, and all Relation:
 Prince, Subject, Father, Sonne, are things forgot,
 For every man alone thinks he has got
 To be a Phoenix, and that what he can bee
 None of that kind, of which he is, but he.

Remarkable to us may seem the feeling that with the loss of the astronomical order the social order — the just relation of father and son, of prince and subject — is gone as well. A clear example of change in appreciation of the world may be the cultural impact of the earthquake that destroyed Lissabon in 1775. The French philosopher Voltaire wrote a *Poème sur le désastre de Lisbonne* (1756). In Voltaire's book *Candide ou l'Optimisme* (1759) the philosopher Pangloss keeps defending that this is the best of all possible worlds. The location of the nose is an example of divine providence, as well as the fact that the need for glasses suggests a lack of divine providence. The more Pangloss argues his case, the less it becomes convincing.

Whereas the medieval synthesis affirmed the world as God's good creation, the present perception allows more for meaninglessness and ambivalence, among the spectrum of valuations of the world.

Changes in our understanding of religion may be related to all three developments mentioned above.

Firstly, some have attempted to adapt contemporary theology to the substantial changes in our view of the world. Creation is no longer understood as a once and for all event, but rather as a continuous process. Adaptation to the contents of our contemporary insights about the world has its problems. We are evolutionary adapted to think in terms closely connected with common sense experiences: "the sun rises" rather than "the Earth turns". Similarly, we are prone to imagining concepts like "heaven" as "above", even if it is hard to maintain that there is a throne on the clouds in a time of worldwide travel by air. As students and teachers of physics experience regularly, it is not easy to free ourselves from the categories of thinking which were fruitful dealing with the meso-level of reality that was relevant to survival in the evolutionary development of the human species. Many persons experience changes in our way of conceiving of reality as an unnerving loss, even though some attempt to develop new images.

Secondly, theology has responded to the emphasis on the human role in knowledge, for example by withdrawing to "feeling" (Schleiermacher), by taking up Kant's transcendental argumentations about the conditions for the possibility of knowledge or of ethics in a religious context, by turning to the subjective and personal (e.g. Martin Buber's "I — thou" in contrast with "I — it"), or by focusing on religious language of tradition.

Thirdly, the change in the appreciation of the world has affected theology. This is most explicit in the views of those theologians that have moved from an understanding of God in metaphysical terms, say as the Ground of Being, to an understanding of God as being on the side of the victims, the poor, etc. The "Death of God" discussion of the nineteen-sixties has something to do with the stronger emphasis on human autonomy both in knowledge

(the previous point) and in responsibility, as well as with a strong sense of the reality of horror, of injustice in the world.⁴

Thus, various authors writing on science-and-religion may easily talk past each other, even though they seem to address the same issues. Underlying decisions shape the way the dialogue is presented. We will discuss examples of the contemporary scene in two clusters. Are physics and theology engaged in a common quest for understanding aiming at cognitive harmony (II)? If the different roles of science and religion are emphasized, the shape of the interaction of science and religion will be different (III).

II. RELEVANCE A COMMON COGNITIVE PROJECT?

The cognitive relevance of science for religion may be clustered around three issues: God, meaning and mystery. How might one think about God in relation to the Universe (1)? Is there an ultimate meaning to human existence in the Universe (2)? Is mystery a persistent ground for religious wonder (3)?

1. God

Empirical science arose, according to A.N. Whitehead (1926), when God was conceived of as endowed with “the personal energy of Jehovah and with the rationality of a Greek philosopher”. The properties of the world could not have been deduced by thought alone (the Greek strand), but neither could they be taken to be purely whimsical, without regularities, totally dependent upon the mood of some deity. Upon such a view of the rise of modern science, science and belief in God were allies rather than enemies. One could question this view of the history of science by pointing to other factors, like the development of technology. However, the themes contingency and rationality still show up in various guises in discussions about relevance of science for theology. “Design” as the most qualitative notion in this context may be related to specific intentions of the supreme being, like its love for humans and its longing for a free response.

What kind of God? “The most miraculous thing is happening. The physicists are getting down to the nitty-gritty, they’ve really just about pared things down to the ultimate details, and the last thing they ever expected to happen is happening. God is showing through. (...) Mr. Kohler, What kind of God is showing through, exactly?”⁵

As in the quoted dialogue, it may be relevant to ask “what kind of God” is brought forward in the context of a cognitive dialogue between science and religion.

⁴ This underlies also the rejection of a theoretical theodicy by Surin (1896), who proposes that one should rather focus on a practical theodicy. Thus, one should ask what we as God’s creatures do to overcome evil and suffering rather than whether the existence of an omnipotent and loving God and the Amount of evil and suffering are compatible.

⁵ J. Updike, *Roger’s Version*, New York 1989, p. 9.

Firstly, there is the **deistic** idea that the main focus is on the creator, understood as the originator, of reality. "God's is thought of as cosmic watchmaker, the engineer who constructed it and lit the fuse, the initial source." Carl Sagan wrote in his preface to Stephen Hawking's *Brief History of Time* that the consequence of Hawking's theory, if Hawking is right, is that there is no absolute beginning of reality, and therefore no need for a creator: "the conclusion of the effort, at least so far: a universe with no edge in space, no beginning or end in time, and nothing for a Creator to do" (Sagan in Hawking 1988, X). A similar notion of God seems to be the aim of the argument that purport to show that there was an absolute beginning, inexplicable within the Universe, which suggests a cause beyond the Universe.

Secondly, one might discern a more **platonizing** strand, thinking God after the realm of ideas. A recent example of such platonizing tendencies among theoretical physicists is Roger Penrose, who defended in his *The Emperor's New Mind* the reality of a timeless realm of mathematical truths, without explicitly relating it to religious concepts. And Paul Davies plunges into these issues in his *The Mind of God* upon discussing the existence of the Universe, which might be traced to the laws of nature, which forces one into a discussion about the relation between mathematics and reality.

Thirdly, one might consider a **theistic** concept of God which has God both as the highest (transcendent, timeless) being and as the original creator. A third element is that God is understood to be active in time, either in human history or in the whole course of evolution (*creatio continua*). This position is not easy, since it attempts to embrace the preceding concepts which are difficult in themselves, as well as hard to combine with each other and with the third element. That active presence of God in history may be mitigated by reinterpreting it in a more platonizing or deistic way. However, some attempt to maintain a place for such a specific divine action in the (apparent)? openness of natural processes, for example in complex systems or in the context of quantum uncertainty.

Fourthly, one might think of a **pantheistic** understanding, which opts for an ontological identity of God and the world, rather than the more dualistic conceptions mentioned before. "God" language may, for example, be apt to express the world as far as it is not expressible in the language of science. We will return to such views below ((3), on mystery).

„God" is not the central concept of all contemporary religious thought. "Meaning" is a replacement which seems quite useful in contemporary secular western culture, either as a replacement or as a more neutral term, making the business of theologians palatable in a wider culture as it is less suggestive of anything supernatural. The focus on "meaning" will be central to the following section.

2. Meaning human existence in the universe

Order out of Chaos by Ilya Prigogine and Isabelle Stengers has as the title in the original French edition *La Nouvelle Alliance Métamorphose de la Science* (1979). The claim is that there is a new alliance between man and nature, due to changes in science. The classical (Newtonian) physical sciences used to think of reality in a way which declared human experiences to be illusions (for example the experience of the passing of time). Human existence was itself a marginal side product of the evolutionary process of mutation and selection. But changes in science are believed to have paved the way for a new view of the meaningful place of humanity in natural reality. Unlike the covenant of Moses at Mount Sinai, this one is not primarily related to a God who transcends reality, but rooted in physical reality itself. Humanity is no longer a stranger in a mechanistic world. Rather, within the Universe there is a tendency towards higher complexity and order, a counter-agency against degradation, according to the Belgian philosopher of religion Van der Veken (1990, 94). Thus, he titles his book *A cosmos for living* rather than speaking of "a universe". Various ideas that go under the name of "holism", eclectically linking physics with elements from eastern religious stand within a similar search for meaning.

In the section on the historical background of these discussions, the distance between us and the medieval synthesis was attributed to three factors: changes in the content of knowledge, changes in our ideas regarding the nature of knowledge, and changes in appreciation of the world. Here it is argued that changes in the content have reopened the way for a new synthesis with a positive appreciation of the world, thus overcoming the first and the third factor. Reflections on God (preceding section) tend to be less interested in the appreciation of the world and more in thinking through the possibility of something beyond nature and the way that may act upon natural reality. Reflections which give a prominent place to questions regarding the meaning of human existence, tend to ask about harmonious correlations between human nature and physical reality. This clearly stands within "relevance" approach of science for religion.

When Nobel prize winner Prigogine and his co-author Stengers claimed a "new covenant", they responded to Nobel prize winner Jacques Monod whose influential book *Chance and Necessity* ended with the following sobering (or liberating?) thought.

The ancient covenant is in pieces; man at last knows that he is alone in the unfeeling immensity of the universe, out of which he emerged only by chance. Neither his destiny nor his duty have been written down. The kingdom above or the darkness below: it is for him to choose.

The kingdom above is the kingdom of knowledge, "within man, where progressively freed both from material constraints and from the misleading servitudes of animism, man could at least live authentically" (Monod 1971, 167).

The “darkness below” is variety of animism, including utopian ideologies such as historical materialism. The ethics of knowledge is based on an ethical choice, an axiom which humans impose on themselves. It “thereby differs from animist ethics, which all claim to be based on the “knowledge” of immanent, religious or “natural” laws which are supposed to impose themselves on man” (ibid. 1971, 164). Animisms fail to make the proper discrimination between judgements of value and those of knowledge.

It is perfectly true that science attacks values. Not directly, since science is no judge of them and must ignore them; but it subverts every one of the mythical or philosophical ontogenies upon which the animist tradition, from the Australian aborigines to the dialectical materialists, has based morality: values, duties, prohibitions. If he accepts this message in its full significance, man must at last wake out of his millenary dream and discover his total solitude, his fundamental isolation. He must realize that, like a gypsy, he lives on the boundary of an alien world; a world which is deaf to his music, and is indifferent to his hopes as it is to his suffering or his crimes (Monod 1971, 160).

Whereas Prigogine and Van der Veken may be seen to argue for the close ties between humanity and the cosmic processes, Monod describes humanity as a cosmic oddity, arisen by accident. Meaning is not found in that process, which is described by science, but rather in a more existentialistic mood in the human choice for objectivity. Objectivity as an ethical axiom cannot itself be based upon some scientific objective basis. It is this ethical axiom which bars science from becoming a basis for further values.

The ethical controversy between Monod and thinkers like Prigogine seems to be whether the aim of morality and of science should be to integrate or to question for the sake of truth and morality.

A paradigmatic quote from the physical sciences has become the words of another Nobel prize winner, Steven Weinberg at the close of his *The First Three Minutes* (1977), an introduction to modern cosmology. He describes himself writing in an airplane, looking down upon Earth which looks mild and friendly in an overwhelmingly hostile Universe. Reflecting on the far future of incredible cold or unbearable heat, he concludes that “the more the Universe is comprehensible, the more it also seems pointless”. He mitigates his conclusion somewhat in his final sentence, where he suggests that the effort to understand the universe is one of the very few things that lifts human life a little above the level of farce, and gives it some of the grace of tragedy. His perspective on the far future has been challenged by Dyson and Tipler. However, it still seems to be the dominant perspective within the context of astrophysical cosmology.

The merits of various proposals deserve, of course, more detailed discussion than can be given here. I want to conclude by suggesting an intermediate position, between meaninglessness and meaningfulness of the Universe. The Canadian astronomer Hubert Reeves refers to the myth of Prometheus when he discusses the development of nuclear weapons. An unprecedented capability for destruction is based on an impressive amount of knowledge. We are placed in a border zone, between good and evil. The development of complexity, life,

consciousness and intelligence in the course of cosmic evolution is ambivalent. Meaning is something we may create, rather than detect. Life is accompanied by doubt and uncertainties. Whether uncertainty could be seen as another common ground where science and theology could meet, will be discussed in the next section.

3. Mystery a common awareness of not-knowing?

Robert Jastrow concluded his *God and the Astronomers* with the following image. For the scientist who has lived by his faith in the power of reason, the story ends like a bad dream. He has scaled the mountains of ignorance; he is about to conquer the highest peak; as he pulls himself over the final rock, he is greeted by a band of theologians who have been sitting there for centuries (Jastrow 1980, 125).

The essence of modern cosmology is, according to Jastrow, that the Universe “began at a certain moment of time, and under circumstances that seem to make it impossible — not just now, but *ever* — to find out what force or forces brought the world into being at the moment” (1980, 12). Theology always lived with awareness of its inability to express what God is. This section will not deal with the cosmological issue; Jastrow’s specific example might be in need of modification due to quantum cosmological research. The issue here is the emphasis on the limits of human knowledge. Is there a common meeting ground for religion and science in not-knowing?

One of the Ten Commandments in the Jewish and Christian heritage is the prohibition against worshipping idols, as such a practice is considered religiously and socially destructive. The Greek heritage developed a more metaphysical and epistemological critique of anthropomorphic concepts of God, as the origin of knowledge and existence is itself beyond knowledge. Later systematic thought distinguished between two ways of considering God’s attributes. The first way is one of extrapolation and affirmation. We know to a certain extent what power, presence, and wisdom mean. God is thought of as omnipotent, omnipresent and omniscient. The other approach is labelled the *via negativa*: we deny features of reality in reflecting upon God. Stating that God is a-temporal is not a positive statement about God’s nature, but a denial of temporality. “God is infinite” is not a cognitive statement, as if one claimed to know what “infinite” meant, but a denial of creaturely finitude. Sallie McFague in her book on *Metaphorical Theology* emphasizes that we should respect the “isnot” character of metaphors, especially in religion, as they save us from absolutizing images and falling into idolatry. That would result in a loss of sensitivity for the symbolic nature of religious language. Thus, recognition of God as the unknowable, as a mystery at the heart of religion, seems well rooted in religious thought.

Does science leave room for mystery? Some clarification of the scope of the term "Universe" as the domain of science may be helpful. And are there any reasons within science to assume that there is a mystery about which we cannot speak scientifically? At least four questions seem open for discussion regarding such ideas, two in relation to science and two in relation to the religious use of the ideas.

a. Mystery and science

One item for the discussion is the claim that science suggests unknowable or veiled reality within the context of the known. This is strongly linked with discussions regarding scientific realism, especially if realism is taken to mean that science is progressively approximating the correct theory, with theoretical terms in that genuine theory genuinely corresponding to the aspects of the reality outside the theory.

Besides, one should not merely consider what we do not know (which might be knowable or unknowable), but also that which we know negatively. Ideas previously held to be true, or probable, have been shown to be wrong, or at least probably wrong. Science may well be used to critique ideas about that reality. This could be liberating, as it creates room for new ideas.

b. Mystery and religion

If the kind of "veiled reality" (D'Espagnat) or "Boundless existence" (Munitz) is taken seriously, one still may wonder what its significance for religion can be. Is it merely an expression of our cognitive limitations, and the recognition of unknowable or partly knowable aspects of reality? Is that sufficient to inspire religious awe? Or does religious mystery presuppose certain qualities about that mysterious reality, which might make associations with love, trust or beauty justified? It is not clear to me how such a transition of categories is to be made in the context of these approaches.

Besides, there may well be a strong hesitancy in theological circles to make too much of these apparent mysterious aspects. The methodological catch word is the "God-of-the-gaps". It has happened that gaps in a scientific account, whether an account of the evolution of the human out of earlier mammals, or of complex physical phenomena, were seen as possible loci of special divine intervention. Such an approach disregards the coherence of the scientific account, and is well in danger of resulting in a religious position which is always on the retreat as science successively fills such gaps. Are there gaps which do not erode? Are these mysteries of Munitz and D'Espagnat persistent? Or will there be a future theory beyond quantum physics which lends itself much better to an interpretation of reality in a single scheme of objective reality, without the distinction between veiled and empirical reality? One might connect this back to the earlier discussion about contingency: is there any contingency that will be inaccessible to science?

Are the laws of nature possible candidates, or might they be necessary? And what about the existence of something rather than nothing?

c. Mystery of existence

Relative to a framework in which we exist the Universe necessarily exists — but such a necessity has a *post factum* character. Relative to a framework which allows for nothingness, an “outside” or “beyond” with respect to anything in the Universe, the contingency of existence seems unassailable. I have for a long time considered this to be a stop-gap, a last resort for the theologian if there is nothing else to claim, the “God of the ultimate gap”. I still doubt whether this contingency of existence is useful in a cosmological argument for the existence of God. It seems equally well possible to accept the Universe as a brute fact, which just happens to be. But nonetheless, this contingency is related to a sense of wonder. It has been described aptly by the physicist Charles Misner, who wrote: “To say that God created the Universe does not explain either God or the Universe, but it keeps our consciousness alive to the mysteries of awesome that we might otherwise ignore” (Misner 1977, 95).

To understand the Universe as a gift, as grace, is a way to interpret this sense of amazement and to relate it to an understanding of God.

III. NON-COGNITIVE RELIGION AND SCIENCE

The preceding discussions about God, meaning and mystery assumed the significance of cognitive elements in religion. However, as we saw, in the introduction, for example, in the context of the Galileo case, there have been serious thinkers, both scientists and theologians, who opted for a mutual neutrality. Religion is important as it deals with other aspects of human existence, rather than supplementing scientific explanations with some metaphysics. However, as will be argued below, this does not imply that there is no need for a dialogue with the natural sciences. However, other questions may become more central.

1. Ethics

A dialogue between science and religion could focus on the ethical issues due to science and technology. Medical ethics is a great business; the physicists, chemists and biologists have their issues as well, among which nuclear weapons, environmental pollution and genetic engineering have attracted much public attention.

Besides, one might reflect on the economical ethics involved: what moral considerations are involved in spending so much money in science? Which science would be justified? Science needs a cultural support which values the search for knowledge, even if it is not profitable in a direct sense. Otherwise, astrophysics

and cosmology might well be suspended. It is not amazing that people working on the American Superconducting Supercollider become nervous when nearing presidential elections place domestic social issues high on the public agenda in the USA.

It may be questioned whether such ethical issues are within the province of religion. Not only science has emancipated itself from religion in modern times, but ethics and politics as well. In a liberal society, which Western societies basically are, various religious traditions co-exist under a large umbrella of allegiance to public laws and procedures as well as to general set of human rights and human values. Religion has lost its grip on the public realm, but also on the private realm, where increasing numbers of people tend to base their choices on their own preferences or decisions rather than on allegiance to some religiously prescribed set of behavioral codes. Thus, ethics is not obviously the province of religion anymore.

This is not the place to deal in detail with substantial normative issues, say in medical ethics. However, it is, in my opinion, difficult to claim a special normative contribution from religion. The contribution of religion could be, perhaps, at a deeper level, as it asks after the underlying existential attitude. For example, in discussing medical ethics one comes across views regarding human finitude and death. Are we willing to accept finitude, or is it an evil to be fought at all costs? And how do "life" and "quality of life" count?

Thus, from ethics one enters into a more existential type of questions. Besides, our view of human nature is relevant to ethics. We will turn to that in the next section.

2. Anthropology

What is the "place" of values in a world of facts? Are they absolute? Do they exist in some platonic realm? Or are they evolutionary products which achieved an apparent absolute status while actually being social codes used to enhance survival chances for one's group in the competition with other groups of hominids?

Does "free will" fit into scientific descriptions? Can it be caught in the language of chance and necessity, of determination and randomness? If not, is the experience of free choice real or illusion?

What drives humans? Is apparently idealistic or altruistic behaviour real or inspired by a search for social status which ultimately benefits one's genes? What is the neuro-biology of hate, love, fear, guilt and the like?

What may we expect? Is there any ultimate basis for hope and trust, or are these human terms which function in a social context?

This seems to be a natural domain for religion, as "the religious symbols out of which it [theology] works embrace within themselves both the *is* and the *ought* and also an expression of how the two are unified" (Hefner 1981, 58).

In the dialogue with physics, it may seem as if the natural sciences leave ample room for fundamental humanistic concerns. However, in biology it encroaches more on these aspects of the human. Scientific approaches to issues like free will and moral judgements tend to be functionalistic, practice-related. The functionalism of evolutionary explanations may be seen as suggesting a cynical view of morality. Whereas sociobiology tends to such a functionalistic approach, physics might be brought in for a more ontological reflection — say about determinism or a platonic realm of values.

The whole complex of problems arises due to the expansive character of science. It seems as if there are no boundaries to scientific enquiry. It expands its territory from relatively simple systems such as balls rolling down slopes to complex systems, such as the human brain. The expansion goes hand in hand with the critical role of science with respect to common sense views, which are apparently revealed to be adequate illusions. Whereas we tend to think of space as flat (Euclidean), relativity theories have criticized that. Whereas we consider a table to be solid, quantum theories offer a rather different view of substance. The gap between “the two cultures” is a philosophical one about the status that should be granted to human experience and practice as articulated at the meso-level of common sense.

One more remark concerns the apparent reductionistic tendency of such approaches. However, it may be defended that these approaches stem “from the ‘holistic’ recognition that there is no fundamental barrier between our biological nature and our cultural and historical life” (Eaves and Gross 1990, 16). Others have spoken of “well-winnowed wisdom” that is embodied in our biological make up. Hence, religion and morality may, perhaps, be seen in that context, but that does not exclude that there is relevant wisdom in them. This may be reflected upon in diachronic (evolutionary) accounts as well as in synchronic accounts (genetics and neurophysiology).

A role for physics aside of biology? At a conference on Wolfhart Pannenberg’s *Anthropology in Theological Perspective* (1985), he was questioned by Lindon Eaves (1989) on the absence of biological perspectives in his discussion of human nature. The answer by Pannenberg was that he stuck to thermodynamics, e.g. the work of Prigogine and others on open systems, when he wished to discuss life, whereas he turned to anthropologies of a more philosophical nature when discussing the distinctively human.

The move to physics in reflecting on free will has been defended by others as well. Quantum theories, thermodynamics, chaos theories, and the like are appealed to. An example is the work of John Polkinghorne, a professor of theoretical physics, who has become an anglican priest. He seeks to identify a basis for human freedom and mind as well as for divine action in the world.

„Chaotic dynamics would represent the first primitive stirring of openness as one mounted the ladder of complexity leading from matter to mind. (...)”

Agency through the holistic operation of information within the intrinsic flexibility of complex physical systems, might also be a way of understanding God's action in the world".⁶

He is interested in openness both towards the future and for structuring influences with aside of any bottom-up account. However, concepts like freedom, determinism and predictability are more problematic than Polkinghorne seems to acknowledge. For example, Earman (1984) gives a detailed analysis of the meaning of determinism in different contexts. Determinism is, according to his treatment, not identical with a state at t_1 causing a state at t_2 , and certainly not necessarily so in a future direction, nor should it be confused with (un)predictability. It is not even dependent upon the notion of a flow of time, contrary to Polkinghorne, who argues that "chaos theory's intimation of openness" implies a flow of time, the future not being there waiting for us.

Freedom is linked with holistic properties, more or less as self-determination. However, I see two dangers. On the one hand, the emphasis on unpredictability and the like, the physical side of the alleged openness if seen from bottom-up, makes it hard to see a conscious or intentional decision as a form of selfdetermination, as the openness persists at all levels. What makes a "self" into a unit that is not again characterized so much as openness, room for manoeuvre, but is a principle of selection? Is there not a shift in category involved? On the other hand, the emphasis on the top-down causation or emergence may also restrict genuine human freedom as self-determination by invoking larger systems (culture, sociological determinism). What is the self that determines?

Such approaches are dependent on the physical theories involved, and their interpretations. Quantum physics allows for various interpretations, some of which are explicitly deterministic (like the Many Worlds Interpretation). Contemporary chaos theory is deterministic. Thus, Polkinghorne distances himself from chaos theory by moving from "determinism" + "unpredictability" to "ontological openness" + "unpredictability". This move is made for philosophical rather than for physical reasons.

Aside of the eclectic use and interpretation of these theories, could one not see the amazing feature of the study of such self-organizing systems in the fact that they exhibit behaviour as if they were guided by an external organizing principle, but that they behaviour turns out to be explainable without invoking any such actor — whether a life force or an informant. As such, chaos theory seems to be more extension of the bottom-up program to complex systems than suggesting the existence of some "top" or "self" from which proceeds "intentional causation" downwards.

⁶ From an unpublished paper delivered to the conference on *Quantum Creation and the Laws of Nature* at Castel Gandolfo, Sept. 1991, to be published in a book edited by R.J. Russell, N. Murphy and C.J. Isham, early 1993, probably by Vatican Observatory Press and University of Notre Dame Press. See also Polkinghorne's books (1986, 1989, 1991) which argue along the same lines.

Anyhow, the use of contemporary physics in arguments regarding determinism, free will and self-determination is not easy. I have the strong impression that some of the problems arise due to the implicit lap from physical discourse to the discourse of the humanities. The intermediate levels of biological reality enriches the conceptuality both with respect to the person and the environment in such a way that might well change discussion. Using physics while avoiding the confrontation with geneticists and the like seems a rather arbitrary eclectic approach. However, the reverse is a question worth pondering by those that dismiss physics as a contributor to the issue. Can one think about free will without allowing for various possible outcomes, and hence an ontology which allows for various possibilities in connection with actuality? Or is a fully deterministic view, with no local contingencies left, acceptable?

3. Personal note

My interest in religion started with the line related to this chapter: religion is relevant in contemporary culture because it does other things than science, not merely extending the scientific explanation with a metaphysical one (as in chapter 2). The tension between what is and what should be, is central to my understanding of religion. In that context, I am interested in promoting awareness of the limitations of the natural sciences, as to leave room for values, for free will, for meaningfulness or at least the challenge to create meaningfulness. This line of thought might be linked with the prophetic strand in the Christian tradition.

Only emphasizing the tension, the absence of God, the need to change the world, to promote the good and fight evil, is disappointing. What would one give the power to do so? The Christian tradition has another strand — which may perhaps be labelled mystical — of affirmation, of being aware of the presence of God. In modern terms that might be expressed as a sense of basic trust or meaning. I cannot localize that in the sense of a heaven above or a Kingdom in the future. Nor can I prove trust to be deserved. Why would one trust reality? Nonetheless, I appreciate it that the Christian heritage is characterized by both affirmation and tension. The affirmative strand has more connections to the questions discussed in chapter 2 above.

Some have avoided the problematic combination of these two strands. One way is to separate the two. Marcion (2d century) may be a paradigmatic example, separating the good God, father of Jesus Christ, the point of orientation, from the more ambivalent God the Creator. Another way is to deny the tension, as is characteristic of much “new age holism”. If one takes the right point of view, reality is whole. For example, Fritjof Capra, labels in *The Turning Point* all our critical situations a “crisis of perception”. However, the reality of evil and suffering is too significant to make this option plausible to me. A third way would be to deny the affirmative strand, any universal basis beyond the way humans

deal with each other in close family networks or among friends. That might be a stoic attitude, and I sympathize with it. However, I have already stated my interest in maintaining the affirmative line in combination with the exhortative line. Thus, I am interested in the items discussed in section II — especially II.3, the room for wonder, and the intriguing issues of intelligibility and order and existence discussed in II.1. However, I am impressed by the scientific approaches to human nature and human culture, which seem to me to underline again the philosophical point that religion is a significant human product. There seems to be a fundamental circularity, in that the religious ideas developed in us and by us speak about a reality which is supposed to carry us, including our own ideas. The image is that of Christopher, who carried a child across a river, not knowing that the child was Christ, carrying the word (including Christopher). We cannot avoid our own limitations in knowing reality, nor can we avoid our own, responsibility in acting, but we nonetheless might attempt to know and act upon the assumption that we are carried by something — power, mystery, love? — far beyond us.

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FIZYKA I RELIGIA WPROWADZENIE DOTYCZĄCE ZNACZENIA I NEUTRALNOŚCI

Streszczenie

Autor prezentuje szerokie spektrum stanowisk w kwestii znaczenia wiedzy naukowej dla wiary religijnej. Po krótkim przeglądzie historycznym (średniowieczna synteza, powstanie nauk przyrodniczych), autor szerzej przedstawia trzy stanowiska: nauka ma negatywne znaczenie dla religii, nauka ma pozytywne znaczenie dla religii, religia winna być odseparowana od nauki. W kontekście tych stanowisk zostały przedstawione źródła nowożytnego ateizmu. Czy religię i naukę łączy perspektywa poznawcza? Poznanie Boga, sens życia i Wszechświata, poczucie tajemnicy z jednej strony i ograniczenia nauki z drugiej — to tematy, które można dyskutować w tej perspektywie. Ale religia ma również aspekty nie związane bezpośrednio z poznaniem: problemy etyczne i niektóre problemy dotyczące człowieka, protetyczna funkcja religii... Istnieją stanowiska, które akcentują te aspekty religii. Autor sympatyzuje z tymi stanowiskami, ale sądzi, że i tych aspektów religii nie można odpowiedzialnie dyskutować z pominięciem naukowego kontekstu.

(Ks. M. Heller)