Rocznik Filozoficzny Ignatianum • The Ignatianum Philosophical Yearbook
https://czasopisma.ignatianum.edu.pl/index.php/rfi XXIV / 1 (2018), s. 97–116
• Sprawozdania i referaty • Reports and conference papers •
PL ISSN 2300–1402

Andreas Losch*
*Universität Bern

A physicist's belief. John Polkinghorne's consonance of theology and science[1]

When popular physicist Stephen Hawking dreams at the end of his best-selling *Brief history of time* of a Great Unifying Theory (GUT) which would be able to merge the major physical theories describing the laws of nature, he goes on to say:

> However, if we discover a complete theory, it should in time be understandable by everyone, not just by a few scientists. Then we shall all, philosophers, scientists and just ordinary people, be able to take part in the discussion of the question of why it is that we and the universe exist. If we find the answer to that, it would be the ultimate triumph of human reason — for then we should know the mind of God[2].

John Polkinghorne, Hawking's colleague at Cambridge University, is on the one hand critical of such an approach. "What is God do-

[1] This contribution is a translated, edited and much abbreviated version of chapter 2 in Andreas Losch, *Jenseits der Konflikte*. I thank the publisher Vandenhoeck & Ruprecht for the permission to make use of the material.

[2] Hawking, *A brief history of time: From the big bang to black holes*, p. 193.

ing in the book at all?"[3]. On the other hand, he is himself searching for his own very particular version of a GUT. "There is indeed a Theory of Everything, but a theory that is much grander and more comprehensive and intellectually satisfying than any Grand Unified Theory of Particle Physics could ever be"[4]. For former particle physicist Polkinghorne, this theory is his new field of work: theology[5]. How does he come to this? In order to understand this, this article aims first to present Polkinghorne's key ideas in their basic development, before looking more closely at his creed.

1. The development of Polkinghorne's key ideas

John Charlton Polkinghorne, K.B.E, F.R.S[6], who studied under Abdus Salam and is a former pupil and colleague of Paul Dirac, belongs to the group of theoretical physicists who co-developed the standard model of the quark structure of matter that is still valid today[7]. Of his two teachers, both Nobel laureates in physics, the clear mind of Dirac particularly influenced him. The publishers of the Festschrift for Dirac's 80th birthday praise him as follows:

> The simplicity and profound logic of his thought was reflected in all his theories of physics. This became particularly clear when he said, 'God used beautiful mathematics in creating the world[8].

One might almost think that Polkinghorne had taken this remark literally. When the dust began to settle around the correct model of quantum mechanics at the end of the 1970s, Polkinghorne,

[3] Polkinghorne, The Mind of God?, p. 4.

[4] Polkinghorne, *Faith, science and understanding*, p. 25.

[5] Cf. *ibid.*, p. 25.

[6] John C. Polkinghorne has been knighted 1997 and was elected Fellow of the Royal Society in 1974 already.

[7] Cf. Polkinghorne, The life and works of a bottom-up thinker, p. 956.

[8] Kursonoglu & Wigner, *Reminiscenses about a great physicst*, p. xv.

who had always been a devout Christian[9] began to look for new challenges:

> The pursuit of science is an aspect of the *imago dei*. Therefore it does not seem to me strange that these words which I have written while Professor of Mathematical Physics in the University of Cambridge will be published when I am an ordinand studying for the Anglican priesthood[10]

— this is how he ends his popular science book, *The particle play*, in 1979.

The point in time at which he moved from physics to theology is not without significance in terms of understanding his intention. The standard interpretation of quantum mechanics that was by this time broadly established and was to be confirmed by experiments in the early 1980s[11] implies that one should only occupy oneself with what is being measured in a particular experiment, and resolutely ignore everything else — as science journalist David Lindley puts it, "quantum mechanics gets the answer right, and never mind how"[12]. However, this runs counter to the approach of physics: "The normal rule in physics, more so than in any other kind of science, is never to stop asking questions"[13].

It could be said that it is precisely through his move that Polkinghorne remains loyal to the approach of physics. He begins by asking "why" and takes the necessary step from physics up to metaphysics. "Why should one not be allowed to search for what is, as it were, behind physics?", Heisenberg was already asking[14].

> I do not see why there should be a ban on reflecting on the more general questions, because there are said to be no [...]

[9] Polkinghorne, The life and works of a bottom-up thinker, p. 955.
[10] Polkinghorne, *The particle play*, p. 126.
[11] Cf. Polkinghorne, *Rochester roundabout*, p. 159.
[12] Lindley, *The end of physics*, p. 98.
[13] *ibid.*, p. 98.
[14] Heisenberg, *Der Teil und das Ganze*, p. 286.

> clear terms; for if such a ban were in place, one could not even understand quantum theory[15].

For the fundamental physicist, it is unavoidable to examine metaphysical questions: he must interpret. Heisenberg's development of the uncertainty principle was at first of purely epistemological nature, but within a very short time he and most other physicists had given it an ontological interpretation[16]. The metaphysical strategy which the great majority of scientists apply in this process, consciously or not, is the search for maximum correlation between epistemology and ontology, a programme which Polkinghorne identifies as a kind of critical realism. The observer and the object being observed cannot be separated. A "realistic" world-view starts from the premise that the object being observed contributes the defining proportion to the knowledge. This world-view must, however, also be "critical," because in some areas, as in the quantum world, recognised reality appears to be counter-intuitive in terms of common sense, so a naive "objectivity" cannot be enough: "The real is the intelligible, not the observable"[17]. "It is the desire to understand the world that motivates all those who work in fundamental physics," says Polkinghorne. "...the search for understanding will be incomplete if it does not include within itself the religious quest"[18].

1.1. The whole world is God's creation

At the same time, he warns against a simplifying reductionism. The one world in which we live is a many-layered, value-filled reality, of which physics only deals with the "lowest" level. Chemistry, biology, psychology, sociology and also theology describe more complex

[15] Heisenberg, *Der Teil und das Ganze*, p. 283.

[16] Cf. Polkinghorne, The metaphysics of divine action, p. 148. It remains questionable to me, whether this presentation of Heisenberg is fully justified. Potentially it stems from an interpretation of Ian Barbour, *Issues in science and religion*, p. 303f.

[17] *Ibid.*, p. 172.

[18] Polkinghorne, *Science and creation*, p. xi.

levels, at which new realities emerge and exist. Human beings are more than genetically constructed survival machines, and a mechanistic description of them is an anachronism. A world operating like clockwork? Quantum mechanics has banished the demon of determinism once and for all. To the fundamental physicist, in particular, it becomes clear that the subatomic world can no longer be reduced to an atomistic outlook, as demonstrated by the quantum principle of non-locality[19]. A move towards holism is taking place in science, which points towards the possibility of holistic natural laws. Is there, in addition to the effect of the parts of a system on the whole, perhaps also a reverse effect of the whole on its parts? Is that not the experience as we see it in the actions of the human person as a whole? Polkinghorne also asks: Can God's influence on creation not also be understood in the same way? God's creative action is not restricted to the creation in the beginning, but also expresses itself in the work of Providence as *creatio continua*. In the fruitful interaction between "chance" and necessity in the evolution of life, Polkinghorne therefore sees more than genetic variations and environmental influences; in it he sees God's loving intention towards the world, His gift of freedom and the expression of His loyalty[20]. When Jacques Monod concludes from the significance of blind chance that mankind is alone in the universe[21], Polkinghorne counters this with the vision of Julian of Norwich: "Indeed nothing happens by luck or by chance, but all is through the foresight and wisdom of God"[22].

Polkinghorne thereby enters the arena of the classic dispute between theology and science. Even if a defensive attitude can still be detected, it is also clear that an evolutionary worldview has now been accepted by theologians[23]. In the case of Polkinghorne, however, this evolutionary worldview is combined in a very interesting way with

[19] Cf. Polkinghorne, The metaphysics of divine action, p. 149.

[20] Cf. Polkinghorne, *Science and creation*, p. xiii.

[21] Cf. Monod, *Chance and necessity*, p. 180.

[22] Julian of Norwich, *Revelations of Divine Love*, p. 80. Cf. 2.4 »The miracle of Kenosis«.

[23] Cf. Polkinghorne, *Science and theology*, p. 5.

his convictions as a physicist. It is the understanding of the anthropic principle that the fruitful potential of evolution must of necessity already be part of the design of the finely-tuned laws of nuclear physics. God thereby reveals Himself not only as the free origin of contingent events (Wolfhart Pannenberg), but also as the ground of phenomenal order[24]. He is equally the ground of being and of becoming.

1.2. Space for action in the "chaos"

The physical possibility of thinking of true becoming, however, is only made clear by the new kind of physics of complex dynamic systems. It conveys an understanding of the unpredictability of the future of the world, which for Polkinghorne offers the possibility of describing ourselves (and to a certain extent also God) as highly-complex systems which have true freedom of action[25]. He is, of course, aware of the philosophical debate about freedom of will, but for him this is a fundamental fact of human experience[26].

As a serious particle physicist, however, Polkinghorne guards against deliberations which seek to make a direct link between the uncertainty principle of quantum mechanics and the freedom of the human spirit[27]. He finds it more meaningful also to apply the concept of critical realism in the field of classical physics. If epistemology models ontology, it must also be possible to interpret the limits of

[24] Cf. Polkinghorne, *Science and creation*, p. 63.

[25] Cf. Polkinghorne, *Science and providence*, p. 2.

[26] It may be that this deep conviction is an expression of his Anglican belief, defending itself against Arminianism and Calvinism: "Calvinism and Arminianism are both distortions of the truth. We can do justice to the Gospel only if we hold firmly both to the absolute souvereignty of God and to the moral freedom of man, recognizing that is only in the depths of the divine wisdom that what appears to us as a logical contradiction is resolved" (Neill, *Anglicanism*, p. 141).

[27] The missing link between microcosm and macrocosm, articulated in the measurement problem, prohibits such conclusions. For understanding the measurement problem see John Polkinghorne, *Science and theology*, pp. 28–30. Nevertheless, Polkinghorne does hint at a possible connection, see *ibid.*, p. 43.

knowledge in the field of classical physics as ontological openness[28], in which the whole can affect its parts (and also human beings can affect their bodies). Polkinghorne finds such macroscopic limits to knowledge in the unpredictable behaviours of chaotic systems. But how does it fit in with this that the equations forming the basis of the systems have a deterministic nature? People speak of "deterministic chaos". Polkinghorne responds to this by classifying the determinism of the equations "as an approach to a more differentiated and adaptable description of reality"[29]. Their determinism is then not an intrinsic property, but a "downwards" emerging property resulting from the isolated observation of systems. In Polkinghorne's holistic contextualism, human action becomes compatible with the integration of mankind into natural law. Equally, God's action can be conceived as being within the free space of the laws of nature, and since there are intrinsic gaps, this does not mean that He is a "God of the Gaps". Polkinghorne knows, of course, that these assumptions are speculative. They aim to protect the freedom of God and of mankind from scientific reductionisms, which Polkinghorne believes to be no less speculative.

1.3. The fruitfulness of beauty

It is critical realism that assumes a creative participation of the human mind in the process of research. Thus, the principle of economy, the urge towards harmonisation, by which fundamental physics is also driven, highlights the influence of metaphysical criteria in research. The search for harmonisation, for the inspired equation, is the search for beauty — according to a very widespread "belief" among physicists[30]. Polkinghorne defends himself resolutely

[28] It is assumed that we deal with intrinsic and final limits of knowledge here.

[29] Polkinghorne, Ordnung und Chaos, p. 369.

[30] Polkinghorne quotes Dirac, who said about Schrödinger and himself: "It was a sort of act of faith with us that any equations which describe fundamental laws of Nature must have great mathematical beauty in them" (Polkinghorne, *Rochester roundabout*, p. 174).

against philosophers of science (in this case Andrew Pickering[31]) who for this reason want to interpret the world of high-energy physics as a socio-cultural construct, and the development of high-energy physics within the meaning of Thomas Kuhn as a mere "paradigm shift" between incommensurable linguistic worlds[32]. Polkinghorne's own paradigm is the uncertainty principle, interpreted from the point of view of critical realism[33]. Scientists are merely the cartographers of the pre-existing global reality, but every revision paints a more accurate picture. Thus, the theory of relativity has not declared classical physics invalid, but merely inaccurate — although it is still accurate enough to send a space probe to Mars[34]. The relevant criticisms of science do, however, contain moments of truth, which Polkinghorne sees best represented in the reflection of Michael Polanyi that in the search for beauty, "personal knowledge" plays a fundamental role in the motivation of scientific thought. Scientific research is based on unspoken qualities which are acquired through practical experience within the scientific community. All the same, every theory must undergo verification through experiments. "Ye shall know them by their fruits" (Matt. 7:16) is a significant Bible verse for Polkinghorne in this context[35].

1.4. Polkinghorne as a scientist-theologian

Polkinghorne works in close connection with the work of Ian Barbour and Arthur Peacocke, who, like him, had successful scientific careers before devoting themselves to theology. In this work, a scientific way of thinking can possibly be detected, which pays more attention to the reliability and repeatability of results than to their own

[31] Polkinghorne refers in *Rochester roundabout* (p. 167) to Andrew Pickering, *Constructing quarks*.

[32] Cf. Kuhn, *The structure of scientific revolutions*.

[33] Cf. Polkinghorne, The life and works of a bottom-up thinker, p. 961.

[34] Cf. Polkinghorne, *Rochester roundabout*, p. 165.

[35] Cf. Polkinghorne, *One world*, p. 16.

originality[36]. The application of this way of thinking in the humanities is, of course, original, but also points to a certain inexperience with the tradition of the humanities. As a scientist, Polkinghorne, even when tackling theological questions, does not want to give up tried-and-tested and approved scientific methods. Instead of deducing general truths from abstract principles, he wants to develop the theoretical superstructure on top of the phenomenal basis. Polkinghorne calls this inductive-oriented work "bottom-up" thinking. It is reminiscent of the Anglican scriptural principle: "Show us a verse in the Bible that we do not teach, and we will teach it; show us a verse in our teaching that is against Scripture, and we will stop teaching it"[37].

Even if there are some differences resulting from the special nature of the theological object of knowledge, for Polkinghorne theology and science are closely related in terms of method. In comparison with the other two scientist-theologians, he is certainly the one who, in the search for agreements between the disciplines, most strongly emphasises the individuality of the theological way of thinking. He views the formulation of the Nicene Creed as a succinct summary of the various New Testament testimonies of Christ, just as physicists concentrate the physical global phenomena in the tables of formulae[38] — and thereby stands fully in the Anglican tradition. It has already been pointed out that this hardly has a systematic theology, "the usual form of the re-formulation of belief is different: dialogue with the respective dominant philosophical and scientific trend"[39]. For Polkinghorne the Nicene Creed forms the skeleton of belief that must be fleshed out anew by each generation of believers. In his Gifford Lectures, published as "The faith of a physicist"[40], he honours this intention. It may seem unusual that a modern scientist chooses the focal

[36] Cf. Barbour, *Issues in science and religion*, p. 176.

[37] Neill, Anglikanische (Kirchen-)Gemeinschaft, p. 715.

[38] Cf. Polkinghorne, The life and works of a bottom-up thinker, p. 957.

[39] Neill, Anglikanische (Kirchen-)Gemeinschaft, p. 721.

[40] This is the more telling American title of John Polkinghorne, *Science and Christian belief: Theological reflections of a bottom-up thinker*.

point of Christian orthodoxy in order to articulate his belief. Polkinghorne sees this as a challenge: "A scientist expects a fundamental theory to be tough, surprising and exciting"[41].

In a summary after twenty years of theological work, Polkinghorne still sees himself as "a physicist with very serious theological interests"[42], even if, as he says, he would like nothing more than to be transformed into a New Testament scholar. — It is important to have a certain sympathy for English humour, if one is to concern oneself with John Polkinghorne. Just as he and his allies meet with goodwill the theologians who attempt to take account of science, he also expects a similar approach from theologians towards his models. Polkinghorne describes the experiments undertaken by him in the Gifford Lectures, and those undertaken previously by the other two "scientist-theologians", as a kind of systematic "mini-theology", the principle value of which he sees, however, on the same level as the specific contributions of liberation theology and feminist hermeneutics[43]. Their own contribution aims to help avoid short-sighted fallacies from the viewpoint of a scientist. For example, when Wolfhart Pannenberg states that the modern concepts of field and energy have "spiritualised" physics, a physicist has to object, since Einstein's famous equation, $E = mc^2$, says nothing more than that energy is interchangeable with matter[44].

Polkinghorne is equally a missionary for science among theologians and a defender of belief among scientists. His belief in the unity of knowledge is an expression of belief in the one God. For this reason, Polkinghorne understands theology, as stated at the start of this article, as a true and all-encompassing "great unifying theory"[45], which encompasses the sciences, the humanities and world

[41] Polkinghorne, *Science and Christian belief: Theological reflections of a bottom-up thinker*, p. 1.

[42] Polkinghorne, The life and works of a bottom-up thinker, p. 957.

[43] Cf. Polkinghorne, *Belief in God*Polkinghorne:Theology, p. 84.

[44] Cf. Polkinghorne, *Faith, science and understanding*, p. 162.

[45] *Ibid.*, p. 25.

religions alike, while Stephen Hawking suggests that a successful harmonisation could make the God hypothesis redundant.

2. Belief in God in an Age of Science

After this overview, given the title of this article, an analysis of the core ideas of his book *Belief in God in an age of science* shall present the focus of these deliberations. There, Polkinghorne offers a concise presentation of his personal believes regarding natural theology, philosophy of science, Divine Action and the idea of God's kenosis. There are, of course, many more theological areas, in which Polkinghorne exposes himself, but we will restrict ourselves here to the topics mentioned.

2.1. A revised natural theology

Belief in God in an age of science for Polkinghorne means to be certain

> that there is a Mind and a Purpose behind the history of the universe and the One whose veiled presence is intimated in this way is worthy of worship and the ground of hope[46].

This way, Polkinghorne summarizes beginning and end of his theological thoughts. In dialog with the metaphysical attempts of his scientific colleagues, Polkinghorne cares for a *revised natural theology*[47]. Charles Darwin's theory of evolution wasn't the end of any natural theology, but, to the favor of theology, the end of an *interventionist interpretation* of Divine action[48]. Already Charles Kingsley greeted the publication of *The Origin of species* with the words,

[46] Polkinghorne, *Belief in God*, p. 1.

[47] Cf. Polkinghorne, The new natural theology.

[48] Cf. Polkinghorne, *Faith, science and understanding*, p. 197. Concerning the relation to Darwin see also Neill, Anglikanische (Kirchen-)Gemeinschaft, p. 720.

God would allow creation "to make itself"[49]. There are two novelties regarding this revised natural theology: first, it does not contradict scientific knowledge any more, it only reconsiders the philosophical interpretations based on these findings in a wider context. Second, its achievements can only be regarding as "insights"[50] and not as proofs. Therefore, facing the ambiguities of evolution (we recall "nature red in tooth and claw"), natural theology needs to be complemented with a theology of nature:

> We are not now looking to the physical world for hints of God's existence but to God's existence as an aid for understanding why things have developed in the physical world in the manner that they have[51].

It is the question of theodicy, which demonstrates the importance of meaning and of justice for humankind. We live in a world, which is the carrier of value at all levels of our meeting with it. Behind this, Polkinghorne sees the One who is worthy of worship; this is Polkinghorne's revised version of the traditional axiological argument for the existence of God. "Scientific wonder at the rational order of the universe is indeed a partial reading of »the mind of God«", as Polkinghorne comments on Hawking's conclusion in his *Brief history of time*. "Yet there is much more to the mind of God than science will ever discover"[52]. To point out this "more" is theism's contribution today. The "cruciform pattern" of life through death[53] could be regarded as a hint, that the question of theodicy finds its lasting response in an explicitly Christian theology. For Polkinghorne, only the hope for life after death can guarantee the continued meaning of personal in-

[49] Cf. Polkinghorne, *Belief in God*, p. 14.

[50] Cf. Lonergan, *Insight*.

[51] Polkinghorne, *Belief in God*, p. 13.

[52] *Ibid.*, p. 19.

[53] This figure of thought stems from Holmes Rolston III, *Science and religion*, which Polkinghorne does not show. Sometimes it is a problem with Polkinghorne that in his attempt at a reader-friendly presentation with only few annotations, he misses to track the origins of his thoughts.

tegrity. This hope, borrowed deep down in the human mind, can also be of interest for the modern scientist.

2.2. Philosophy of science as meta-physics

Polkinghorne early had the idea that "complementarity… is the scientist's equivalent of the theologian's *perichoresis*, the mutual indwelling of characteristics"[54]. It does not surprise us then that when he later structures the search for truth in five phases, he makes the history of the discovery of the double nature of light parallel to the development of the Chalcedonensian dogma of the double nature of Christ. Like Thomas Kuhn, Polkinghorne wants to base his philosophy of science in history: history "as testing ground of philosophical theorizing"[55]. Divergent from Kuhn, Polkinghorne does not speaks of revolutions, but of *moments of radical revision*, and compares science with the development of dogma instead with political agitation. The postulated parallelism of the ways of knowing in theology and science ends, where Dirac's "revelation"[56] of quantum field theory solves the double nature of light in a highly satisfying way, while the ecumenical councils up to Chalcedon stay focused on defending against misinterpretations of the dogma. Theology can only make use of the open language of symbols. Hence, a continuous wrestling with unsolved problems is its usual situation, and the dogma must stay as it is, a continuous challenge and enduring limit.

[54] Polkinghorne, *Science and creation*, p. 70.

[55] Polkinghorne, *Belief in God*, p. xii.

[56] Cf. *ibid.*, p. 27. Polkinghorne speculates about the involvement of the Holy Spirit in such insights: "No doubt the activity of the unconscious mind plays an important part in what has been going on, but the believer may well wish to suppose that the hidden inspiration of the Spirit has also been involved in bringing new insight" (Polkinghorne & Welker, *Faith in the living God*, p. 78).

2.3. Mind and matter and God's very special Divine Action

As stated initially, the fact that our mind can understand the structures of nature with help of mathematics for Polkinghorne is a consequence of the *imago dei*. Through the "unreasonable effectiveness" of mathematics (Eugene Wigner), an "objective" discipline defends the existence of an independent mental world, which Polkinghorne developed already in *Science and Creation*[57]. Divergent from Platonism, this realm of ideas is for Polkinghorne a created world, comparable to Moltmann's "created heaven" as space of possibilities. Fundamental is Polkinghorne's conviction, that mind is not supervening on matter, but complementary to it.

> The only possibility appears to be a complementary world of mind/matter in which these polar opposites cohere as contrasting aspects of the world-stuff, encountered in greater or lesser states of organization[58].

Humans as psychosomatic "amphibians" participate in both poles, mind and matter, while God as pure spirit acts (within providence) through information alone. Under these assumptions, God's like man's action can be imagined in form of a downward, informational causality of the whole on its parts.

Polkinghorne argues in *Belief in God in an age of science* that there is the need for a very concrete localization of the operation of this holistic principle on the causal nexus of the physical world. He localizes the causal joint in the manner, how a chaotic system's trajectory follows its strange attractor. As the divergent developments of the trajectories can be understood as consequences of minimal disturbances in the context of the whole, some intrinsic unpredictability emerges, which Polkinghorne interprets critical realist as openess for other activities. We recall that "epistemology models ontology", so the epistemological unpredictability hints at a real ontological uncertainty and openness. Polkinghorne parallels quantum mechanics

[57] Cf. Polkinghorne, *Science and creation*, ch. 5.
[58] *Ibid.*, p. 71.

with chaotic systems, without claiming a causal connection between the two theories. Rather, the uncertainty of our knowledge hints at the existence of causalities that had been overlooked before: holistic laws of nature. While their effect needs to be measurable in the emergence of complexity, the *providentia specialis* happens hidden within this new scientific possibility[59]. God's action through active information "is the translation [...] of a long tradition of Christian thinking that refers to the hidden work of the Spirit"[60].

2.4. The miracle of Kenosis

As complex dynamic systems follow the flow of time, the passing of time is a fundamental attribute of the universe. For Polkinghorne, this has far reaching implications for the doctrine of God: if God knows the universe in its temporality, then the experience of time needs to find its place within the Divine Nature. This "gift of process theology" is not difficult to accept for the religion of incarnation. God's Kenosis, expressed in this thought, is an underlying theme of Polkinghorne's theology. He does not only postulate a Kenosis of God's *omnipotence* in the creation of the world. In a world of true becoming even God can't know the future, because it simply doesn't exist yet. The consequent Kenosis of the God's *omniscience* as well emphasizes once more the freedom of creation and creature. "The presence of such contingency does, however, suggest that the evolution of life is not the unfolding of a totally predetermined plan", says Polkinghorne[61]. God's spiritual Action is not to be understood as interventionist influence within the nexus of energetic causes, and has therefore to be understood as *active information* which does not need an energetic carrier. By postulating holistic laws of nature, Polkinghorne cannot really avoid to make God a "cause among causes".

[59] Cf. Polkinghorne, The laws of nature.
[60] Polkinghorne, *Belief in God*, p. 72.
[61] Polkinghorne, *Science and theology*, p. 78.

While criticizing this first as a degradation of God to a demiurge, he later accepts it as a Kenosis of *providence* as well[62].

3. Conclusion

When theology and science are treated with such seriousness, it is only consequential that they enter an interplay, in which not only traditional theology experiences fundamental changes, but also science is confronted with the postulation of new laws of nature. Polkinghorne distinguishes himself therefore from the widespread assumption, only theology would need to learn from science. This fruitful exchange across disciplinary borders is a unique feature (and also the most disputed feature[63]) of his works.

Polkinghorne's approach of a "consonance" of the disciplines assumes that both camps will only harmonize at the very end of it all. "The answers to »How?« and to »Why?« must fit together without strain"[64]. A philosophical examination of his consonance model is to be found in Johannes Maria Steinke, *John Polkinghorne: Konsonanz von Naturwissenschaft und Theologie*[65]. On the one hand, Polkinghorne's distinguishes himself from Barbour's idea of *integration*, which would present for him an assimilation of theology to science. On the other hand, he is convinced that "Physics constrains metaphysics", so there is an asymmetry in favor of the scientific foundation. Is Polkinghorne's approach physicalist at the end? His thinking is shaped by his experiences as a physical scientist, for sure. Yet the full quote regarding the constraints shows, that it is at least not his intent to pursue physicalist thoughts.

---

[62] Cf. Polkinghorne, *Faith, science and understanding*, p. 127; Polkinghorne, The life and works of a bottom-up thinker, p. 961. Cf. also the interesting presentation in Ignacio Silva, John Polkinghorne on divine action. I am not fully convinced, however, that there really is a third phase.

[63] Cf. Russell, *Cosmology*, pp. 130–132.

[64] Polkinghorne, *Science and theology*, p. 22.

[65] Steinke, *John Polkinghorne*.

> Physics — or science generally — constrains metaphysics, but it does not determine it, just as the foundations of a house constrain what can be built on them, but they do not determine the actual form of the edifice[66].

As a non-scientist, one cannot get rid of the feeling, however, that something may have been missed in Polkinghorne's pleasantly orthodox presentation. The missing terrain may be situated somewhere in the realm of *culture*. The role of the humanities, of which theology could be considered a part, at least more than of science, appears as underdetermined. I have explored this attempt of a critique, that our world is more than physics, elsewhere[67].

Very early, in *The particle play* already, Polkinghorne considered whether he does detect a "consonance between the world view of Christianity and the world view of science". He said, he did so, "but I do not suppose that I can prove it for you, any more than someone else could disprove it"[68]. The rationality of the world is what stroke him. There, he is certainly not the only scientist who wonders about this marvel: a world shot-trough with signs of Mind.

Literature

Barbour, I., *Issues in science and religion*, Englewood Cliffs, NJ: Prentice-Hall, 1966.

Hawking, S., *A brief history of time: From the big bang to black holes*, Toronto, New York, London, Sydney, Auckland: Bantam Books, 1989.

Heisenberg, W., *Der Teil und das Ganze: Gespräche im Umkreis der Atomphysik*, München: R. Piper, 1969.

Julian of Norwich, *Revelations of Divine Love*, Harmondsworth/Middlesex: Penguin Books, 1986.

[66] Polkinghorne, Understanding the Universe, p. 175.

[67] Cf. Losch, Our world is more than physics.

[68] Polkinghorne, *The particle play*, p. 125.

Kuhn, T., *The structure of scientific revolutions*, Chicago: University of Chicago Press, 1962.

Kursonoglu, B. & E. Wigner, [Eds.] *Reminiscenses about a great physicst: Paul Adrien Maurice Dirac*, Cambridge: Cambridge University Press, 1987.

Lindley, D., *The end of physics: The myth of a unified theory*, New York: Basic Books, 1993.

Lonergan, B., *Insight: A Study of Human Understanding*, [Ed.] F. Crowe & R. Doran, (Collected Works of Bernard Lonergan, vol. 3), Toronto: University of Toronto Press, Scholarly Publishing Division, 1992.

Losch, A., *Jenseits der Konflikte: Eine konstruktiv-kritische Auseinandersetzung von Theologie und Naturwissenschaft*, (Forschungen zur systematischen und ökumenischen Theologie Band, Bd. 133), Göttingen: Vandenhoeck and Ruprecht, 2011.

Losch, A., *Our world is more than physics: A constructive — critical comment on the current science and theology debate*. Theology and Science 3/3 (2005), pp. 275–290, DOI: 10.1080/14746700500317271.

Monod, J., *Chance and necessity: An essay on the natural philosophy of modern biology*, [Trans. by] A. Wainhouse, New York: Alfred A. Knopf, 1971.

Neill, S., *Anglicanism*, 4th ed., New York: Oxford University Press, 1978.

Neill, S., Anglikanische (Kirchen-)Gemeinschaft, [In:] *Theologische Realenzyklopädie*, [Ed.] G. Müller, [Trans. by] H. Tsolaki, vol. 2, Berlin, New York: Walter de Gruyter, 1978, pp. 713–723.

Pickering, A., *Constructing quarks: A sociological history of particle physics*, Chicago: University of Chicago Press, 1984.

Polkinghorne, J., *Belief in God in an age of science*, (The Terry lectures), New Haven, CT: Yale University Press, 1998.

Polkinghorne, J., *Faith, science and understanding*, New Haven: Yale University Press, 2000.

Polkinghorne, J., *One world: The interaction of science and theology*, London: SPCK, 1986.

Polkinghorne, J., Ordnung und Chaos, [In:] *Theologische Realenzyklopädie*, [Ed.] G. Müller, [Trans. by] H. Tsolaki, vol. 25, Berlin: Walter de Gruyter, 1995, pp. 367–371.

Polkinghorne, J., *Rochester roundabout: The story of high energy physics*, Harlow: Longman, 1989.

Polkinghorne, J., *Science and Christian belief: Theological reflections of a bottom-up thinker*, (Gifford lectures, 1993-1994), London: SPCK, 1994.

Polkinghorne, J., *Science and creation: The search for understanding*, London: SPCK, 1997.

Polkinghorne, J., *Science and providence: God's reaction with the world*, London: SPCK, 1989.

Polkinghorne, J., *Science and theology: An introduction*, London, Minneapolis: SPCK, Fortress Press, 1998.

Polkinghorne, J., The laws of nature and the laws of physics, [In:] *Quantum cosmology and the laws of physics: Scientific perspectives on divine action*, [Ed.] R. Russell, N. Murphy & C. Isham, Vatican City State, Berkeley, CA: Vatican Observatory Publication, The Center for Theology and the Natural, 1993, pp. 429–440.

Polkinghorne, J., *The life and works of a bottom-up thinker*. Zygon 35/4 (2000), pp. 955–962.

Polkinghorne, J., The metaphysics of divine action, [In:] *Chaos and complexity. Scientific perspectives on divine action*, [Ed.] N. Russell R.J.and Murphy & A. Peacocke, Vatican City State, Berkeley, CA: Vatican Observatory Publication, The Center for Theology and the Natural, 1995, pp. 147–156.

Polkinghorne, J., *The Mind of God?*, The Cambridge Review 113/2316 (1992), pp. 3–5.

Polkinghorne, J., *The new natural theology*. Studies in World Christianity 1/1 (1995), pp. 41–50.

Polkinghorne, J., *The particle play*, Oxford, San Francisco: W.H. Freeman, 1979.

Polkinghorne, J., *Understanding the Universe*. Annals of the New York Academy of Sciences 950/1 (2001), pp. 175–182, DOI: 10.1111/j.1749-6632.2001.tb02136.x.

Polkinghorne, J. & M. Welker, *Faith in the living God*, London: SPCK, 2001.

Rolston III, H., *Science and religion: A critical survey*, Philadelphia: Temple University Press, 2006.

Russell, R., *Cosmology: From alpha to omega*, (Theology and the sciences), Minneapolis: Fortress Press, 2008.

Silva, I., *John Polkinghorne on divine action: a coherent theological evolution*. Science and Christian Belief 24/1 (2012), pp. 19–30.

Steinke, J., *John Polkinghorne: Konsonanz von Naturwissenschaft und Theologie*, (Religion, Theologie und Naturwissenschaft, Bd. 4), Göttingen: Vandenhoeck und Ruprecht, 2006.