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Michael Heller's Theology of Science in a Trinitarian Perspective: Ontological Aspects

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Abstract. This paper explores the program of theology of science proposed by renowned Polish physicist and philosopher, Michael Heller, with a particular focus on its ontological dimensions through the lens of Trinitarian theology. Firstly, an overview of the status and current discussions of theology of science is presented. Next, drawing on Heller's key texts the Trinitarian doctrine is used to enhance the intelligibility of the Universe, wherein the dynamic interplay of unity, diversity, and relationality is mirrored in the structure of physical reality itself. Most importantly, however, we examine how Heller's theological perspective thus equipped provides justification for the specificity of the method of science itself, thereby revealing new dimensions of relations between science and theology. Through the engagement with Heller's thought, this paper seeks ultimately to illuminate the profound implications of a Trinitarian perspective in his theology of science, shedding light on the interconnectedness of Christian doctrine and ontology in shaping our understanding of the universe and its underlying structure.

Keywords: theology of science, ontology, relation, Trinity, method of science.

Introduction

Theology of science is a program of relating theology and science proposed by renowned Polish physicist, philosopher and theologian, Michael Heller, the laureate of the Templeton Prize in 2008. The program was briefly announced in the 1992 Polish original of his work entitled *Nowa fizyka i nowa teologia* (Heller 1992a) published in 1996 in English under the same title *The New Physics and a New Theology* (Heller 1996a). More recently Heller published in Polish a short textbook on theology of science: *Nauka i Teologia – niekoniecznie tylko na jednej planecie* (*Science and Theology – Not Necessarily on One Planet*) (Heller 2019a). Despite of its intriguing designation, Heller's program is not an isolated voice on how theology can assist in comprehending the mystery of the Universe and in justifying the method of science by which the Universe can be known. The program draws from the thought of an array of prominent figures who explore the boundaries between theology and science such as Ian Barbour (e.g., 1997; 2016), Nancey Murphy (e.g., 1993), John Polkinghorne (e.g., 2007) or Arthur Peacocke (e.g., 1993). The importance of theology of science finds its confirmation not only in the accounts of its content (Macek 2010; Maziarka 2016) but in critical surveys of its scope and the limits which were undertaken by authors who contributed to a volume in Polish entitled *Teologia nauki* (*Theology of science*) (Mączka and Urbańczyk 2015). As they clearly admit, many methodological and conceptual issues that arise in theology of science remain to be resolved in more in-depth studies.

The goal of this article is twofold. Firstly, it aims at the critical assessment of the theological and scientific motivations as well as the recent developments in the program of theology of science. Secondly, a perspective on how to situate theology of science in the context of the Trinitarian doctrine and how to enrich some of its outcomes with the tenets of this doctrine will be presented. The reason for this choice follows that formulated by Polkinghorne who maintains that this doctrine is the true "Theory of Everything" for the Christian (Polkinghorne 2010a, 12) and as such it warrants the maximal explanative depth suggestively referred

to by Polkinghorne as the "theological thickness" (Polkinghorne 2004, 88–117). It will be shown that the Christian doctrine on the Holy Trinity not only enhances the intelligibility of the contingent Universe as a work of the Divine creation beyond what is revealed by the method of the contemporary science but, more importantly, it sheds valuable light on the specificity of this method as well. In regards to ontology, the relational character of the fundamental ontology of the Universe will receive its significant explanative support. On a more general level, the article advances the dialogue between science and religion by showing that the rationality of the theological perspective does not result in drowning science in irrational mythology but it helps to promote understanding in domains which lie outside of the competence of science thereby doing justice to the Anselmian dictum *credo ut intelligam*.

1. Foundations

Theology of science is an interdisciplinary program in which Heller integrates decades of his research at the boundary of science (mostly theoretical physics) and philosophy with his deep interest in theology in quest for a coherent vision of how these methodologically distinct areas of rational inquiry come to a fruitful synthesis. It is important to keep in mind that Heller speaks from the point of view of the perspective of the Christian theology. Heller clearly indicates that theology of science is not an entirely original proposal because many of its aspects have been already dealt with in a variety of scattered philosophical and theological treatises which will be invoked in the course of this study (Heller 2015, 13). Heller maintains that theology of science constitutes a genuine part of theology where the methodological specificity of theology applies in full: ,,Theology of science should enrich theology, not science'' (Heller 2019a, 40). In other words, theology of science contributes not to science but to theology suggesting that it does not infringe upon the autonomy of the method of science: it does not enrich science in adding any content to what science discovers. The original declaration of the program of theology in science appeared in Polish as (Heller 1992b; Heller 2003a, 29). The

article reappeared in English as a chapter in (Heller 1996a, 97–99) and in the same year with an improved translation in (Heller 1996b). Ultimately, it was reprinted as (Heller 2003a) and version will be used as a reference throughout this study.

As a scientist, Heller sees the Universe as reality which is defined "as the totality of things that are investigated in the process of doing science". These are the limits of the scientific method that define the boundaries of the Universe that can be understood through natural reasoning. He strongly insists, however, that the scientific rationality does not exhaust all possible rationality, for there are questions that remain beyond the reach of the scientific method and still demand a rational answer (Heller 2003b, 157–158). Theology of science sees the physical Universe in a broader perspective inaccessible to the scientific method. In other words, since there are limits which the scientific method cannot cross, theology of science permits access to these limits "from the other side". Consequently, "the material Universe, as contemplated by theology is richer than the Universe as seen from the scientific perspective" indicating that ,,the Universe of the sciences is but a part of the theological Universe'' (Heller 2003a, 29). The limits of the scientific explanation become visible once one makes "an asymptotic extension of what we know now to the extreme limits of their field of applicability". Questions that arise at these limits concern the method of science itself and the assumptions on which science rests. They are referred to by Heller as the "horizon of the sciences" (Heller 1996a, 51). The assumption of science most frequently articulated by Heller is the rationality of the Universe (Heller 2019b). Ultimately, the limits of the scientific method point to three *irremovable gaps* proper to the scientific method: the *ontological gap*, the *epistemological gap* and the *axiological gap* (Heller 2003c). In the ontological gap, one poses the Leibnizian question of why something exists rather than nothing. Following Einstein, the epistemological gap raises the question of why the Universe is rational, and the axiological gap addresses the issue of why the Universe is permeated with meaning and values.

When it comes to a more precise defining what theology of science implies, Heller offers initially a very general statement which accommodates

many dimensions in which one can look at science from the theological point of view:

> Speaking in general terms, by theology of science we mean an authentic theological reflection dedicated to the sciences: to their existence, their foundations, their methods and their results (Heller 1996a, 96).

This statement receives more precision and focus when Heller delineates two domains in which he sees the proper contribution of theology of science. The first of them is announced in the following assertion: "As a theological reflection upon the sciences, theology of science would investigate the consequences of the fact that the empirical sciences investigate the Universe, which has been created by God'' (Heller 2003a, 30). The dependence of the Universe's existence on God is technically referred to as its contingency and this property is entirely transparent to the scientific method. Heller's theological standpoint that "God's immanence in the world is its rationality" (Heller 2003d, 57) indicates that the Divine presence in creation is a source of its ordering and intelligibility. This standpoint fits within the general framework of *panentheism* according to which all that exists in the created order is seen as immersed in God. The in-depth analysis of how the Divine immanence and panentheism come into play in the context of the contemporary science has been the subject of many detailed philosophical and theological inquiries (e.g., Życiński 2014; Peacocke 2004).

The second domain, where theology of science enters in, has to do with the fact that "the Universe is impregnated with values" (Heller 2003a, 31). Values are interconnected with the concept of 'good', which, in turn, is associated with the overarching goals of human activity. Taken from the theological point of view, values direct this activity to God as the source of all that is good. The presence of values in the Universe is directly connected with the fact that the Universe was created by God and the Universe shares in its entirety in the works of salvation (Dadaczyński 2015, 88–89). Consequently, to engage in the scientific enterprise entails a moral decision in the pursuit of truth that carries an eschatological di-

mension as well. As Heller points out, "only by living in a world of Value and meaning it is truly worth taking up science" (Heller 2003d, 57).

It turns out that the two strictly delineated domains of theology of science become somewhat broadened in Heller's most recent account of this program outlined in (Heller 2019a). For instance, in his opening address in (Heller 2015) he treats the aggregate of problems commonly labeled "science and theology" as an area *related* to theology of science. However, in the recent account he identifies these issues as central to theology of science and yet expands this range by adding such topics as the role of the image of the world in theology and the reinterpretation of dogma. Inasmuch as these topics do arise at the intersection of science and theology, they rather regard ways in which science enriches theology and not how theology directly illuminates the method and the outcomes of science. This broadening may be attributed to a certain asymmetry that occurs between the language of theology and science. In consequence, theology of science, which is supposed to make pronouncements about science, falls into certain circularity because theology in general does not have independent conceptual frameworks at its disposal and, for that purpose, it must resort to such scientifically informed sources as metaphysical systems, models and metaphors (e.g., Barbour 1974; Russell 2000; Wegter-McNelly 2011; Simmons 2014). The impact of this circularity on the meaningfulness of the outcomes of theology of science is one of the more pressing methodological concerns that this discipline needs to resolve (e.g., Grygiel 2018).

Although not expressly declared, the Trinitarian doctrine has already been introduced into the framework of theology of science by such thinkers as John Polkinghorne, Gisbert Greshake, and several others (Greshake 1997; Polkinghorne 2004; Polkinghorne 2010b). In contrast to *natural theology*, Polkinghorne proposed an approach called the *theology of nature*, corresponding to Heller's first domain of theology of science mentioned earlier in which one explores the theological implications of the contingency of the Universe for how it can be investigated (Polkinghorne 2004, 60–87). In view of Dadaczyński's exposition of theology of science comprising three dimensions of inquiry (Dadaczyński 2015), Polkinghorne's

approach encompasses the ontological and epistemological dimensions, while the axiological dimension aligns directly with the second domain proposed by Heller. Given the substantial complexity of these matters, the main emphasis of this investigation is for the most part ontological confined to the fundamental structure of the Universe only and not to its dynamics. It is essential to recognize, however, that it is this underlying structure that contains potentialities for the evolution of the Universe.

2. Trinity enters the stage

Heller's insistence that theology of science investigates the consequences of the Universe created by God provides an excellent point of departure to take into account that the Divine creative activity is the work of the entire Trinity, that is, God the Father, Jesus Christ His Son and the Holy Spirit. Since in such perspective all that exists finds its ultimate justification in the Triune God, the Trinitarian doctrine is expected to shed important light on what pertains to the Universe and yet remains transparent to the scientific method. A renowned German theologian, Gisbert Greshake, asserts the following:

> If God, the basis, the center and the goal of all that exists, is not a single Divine person but a communion of the interpersonal love, then this ultimate deepest and highest "principle" most fundamentally underpins all created being and becoming and it is intelligible and viable only in the light and through the power of the Trinitarian truth and dynamics (Greshake 1997, 42).

Kallistos Ware adds an important point to express the uniqueness of the Trinitarian doctrine: "Whether, then, we choose to speak in terms of mutual love or mutual joy, the notion of God as a Trinity of interrelated persons provides us with a foundation of the doctrine of creation in a way that strictly unitarian doctrine of God cannot do" (Ware 2010, 124). Greshake's urge that today we need "Trinitarian cosmology" sounds somewhat exaggerated since neither ontology nor cosmology needs theology to justify its claims (Greshake 1997, 42). However, this urge appears

to correlate with the scope of theology of science to the extent that, in the light of the Trinitarian doctrine, not only cosmology but science as a whole receives a new dimension of intelligibility. The proper extent and balance of how far such inferences should be made – and it will be an approach taken up in this study – appears in the following words of Polkinghorne:

> The exercise on which I shall engage is somewhat similar to that which in an earlier age might have been called 'the vestiges of the Trinity'. Of course, I am not claiming that the world is full of entities stamped 'Made by the Holy Trinity'. God's work of creation is rather more subtle than that. What I shall claim is that we cannot infer Trinity from nature but there are aspects of the understanding of the Universe that become more deeply intelligible to us if they are viewed in a Trinitarian perspective (Polkinghorne 2004, 61).

It turns out that Heller makes several remarks on the Trinitarian theology in his work entitled *Bóg i geometria* (*God and Geometry*) (Heller 2021, 107–118). However, these remarks are limited in scope because they refer to some selected historical issues concerning the development of the Trinitarian doctrine in relation to the ontology of relations. No inferences follow on how they build into the program of theology of science and this is exactly the place where this study will bring in its novelty.

While it is not frequently explicitly recognized as originating from the Trinitarian doctrine, the Christian perspective on creation is often regarded as a basis for the emergence of natural science and its method (e.g., Jaki 1979; 1990; Byrne 1995; Jaeger 2010; 2018). The central idea conveyed in this line of reasoning is that a steadfast faith in a free and rational creator was essential for Western thought to foster a dedication to an orderly, contingent universe. This commitment to universal order and contingency is asserted to be crucial for establishing a science that incorporates both mathematical principles and experimental methods. Peter Byrne captures this idea in the following statement:

> Order is presupposed and confirmed in the extension of scientific hypotheses to the remotest spaces and times in the investigation of the cosmos. Yet it

> would be fatal to a science that is ultimately grounded upon experiment and observation if this order were necessary and discoverable *a priori*. But the only guarantee or intelligible explanation of how the universe could be a system of contingent order rests with its creation by a sovereign but rational God. Moreover, its origin in God explains what is otherwise mysterious, namely why this order is such that the human mind can grasp and anticipate it. Here the very existence of science is bound up with the validity of a doctrine of cosmic creation (Byrne 1995, 440).

These preliminary remarks suggest the following areas of detailed inquiry into how the creative act of the Triune God makes science and its method intelligible: (1) unity and diversity, (2) contingency and order and (3) Trinitarian ontology.

3. Unity and diversity

The significance of the Trinitarian doctrine for theology of science becomes manifest in the question why the creation of man and the Universe as autonomous entities distinct from God the Creator was possible at all. The key concept here is that of *createdness* which points to the fundamental dialectics between God and the Universe. As Peter Knauer states: „to be created means to be totally related to… / in radical distinction from…" (Knauer 1986, 27). The concept of creation is a relational one because it assumes that God as a source and principle of being is relational in His essence. If, as Gisbert Greshake observes, God was "an undifferentiated absolute power of being" (Greshake 1996, 328), there would be "no place" for creation. "The undifferentiated absoluteness excludes any independent 'beside' or 'opposite'" (Greshake 1996, 328). In other words, only the Triune God can be a creator because only such God can be the principle of unity and diversity. If God was was the absolute and undifferentiated One or all determining Wholeness, the Universe would inevitably be *particula divina*, an outcome of the Divine emanation or a mere moment of His Divine existence. Only because "there is the Divine Other in God Himself, the possibility of the finite order, namely, the Universe, can also be understood" (Kehl 2006, 244). It turns out that Thomas Aquinas had

been already aware of this point by expressing it the following way: „the knowledge of the Divine persons was necessary … for the right idea of creation" (*Summa Theologiae* I, q. 32, a. 1 ad 3).

To further articulate this truth, Greshake refers to the famous work of Joseph Ratzinger, *Introduction to Christianity*, in which Ratzinger clearly indicates that, contrary to some assertions of the pre-Christian thought, where only unity can be divine, created unity and multiplicity, seen from a Trinitarian perspective, are equally reflections of the divine (Ratzinger 2004, 178–179). As a consequence, Greshake arrives at the key conclusion that "if there were no multiplicity in God, He would not be able to bring forth anything distinct (finite) from Himself. This would mean that God would have set Himself before nothingness" (Greshake 1997, 224). Only the Triune God can thus justify the structure of the created order, in which there is room for both unity and multiplicity, thereby overcoming the ancient view according to which multiplicity is merely the appearance of a deeper unity (e.g., Parmenides). Consequently, Greshake asserts, "the Triune God is not only the principle of the unity of creation but also of its diversity" (Greshake 1997, 224–225).

The importance of the above statements lies in their support for metaphysical realism: the Universe studied by the sciences exists mind-independently and it is not an illusion or a product of human or Divine imagination. It is worthwhile to emphasize that this view contrasts significantly with Hinduism, particularly with the monism of Vedanta, which grew out of the *Upanishads*. German indologist, Heinrich von Stietencorn, asserts the following: „The world is illusion, insofar as it conceals the reality of Brahman. Instead of recognizing Brahman, humans only see the multiplicity of things and cling to them. Like a mirage, Maya reflects to him a reality that he pursues and yet never attains […], because it is transient" (Küng and Stietencron 1999, 98).

The above considerations carry important implications for the specificity of the scientific method the Universe should be studied with. First and foremost, the Trinitarian perspective, in which the Triune God is the principle of unity and diversity, clearly shows that science is possible because the object of its study as well as man who does science both have

commenced their existence within the order of creation. Polkinghorne acknowledges this point by asserting that ,,science is possible because the Universe is a divine creation" (Polkinghorne 1998, 8). With this being an obvious and general statement that is necessary for science as such, a more subtle point comes to the fore in this context: objects in the Universe are not mere appearances of more fundamental unity of the Universe but are physically as real as any general laws that underpin their dynamics and can causally interact with the experimental apparatus thereby returning reliable empirical data. To put things in short, the experimental method could not possibly claim this level of reliability if it were coming in touch with the appearances of things only. The upshot of these considerations is that the Trinitarian perspective comes as an aid to illuminate why man as the doer of science located at a certain place in the Universe and having at his disposal only a handful of locally existing objects can expect to come into contact with a mind-independent reality characterized by a set of properties and that these objects enjoy the same status of contingency as the universal laws that underlie their structure and dynamics. In other words, the reality of unity and diversity allows to better understand that the diverse, to which the empirical method has its more direct access, is not an appearance but is as real as the abstract and as such it can yield valuable information on the structure of the Universe. Further important clarification of this point will follow in the next section as a corollary of the relational character of the fundamental ontology of the Universe.

4. Contingency and order

The property of contingency is predicated of something that exists *non-necessarily*, that is, it exists but it could have not existed, could cease to exist or could be entirely different in its nature (e.g., Walker 2016; Evers 2017). It receives a new dimension of intelligibility when the Divine act of creation is considered as the work of the Triune God. Since the method of science has contingent entities as objects of its inquiry, the Trinitarian perspective is expected to yield a unique insight into why this method

applies so well to the study of the structure of the Universe. In particular, this has to do with the fact that the Universe is not a necessary emanation from the Divine but its coming into being follows from the purest love of God. By being pure love, the Divine persons receive and freely give their fullness to others whereby they provide space for the existence of the Universe. Polkinghorne expresses this thought as follows:

> Divine intrinsic relationality is totally fulfilled in the perichoretic exchanges between the Persons, and so God's creative action it's not demanded by any impulse to meet a divine need for the external supplementation of that relationship. Nevertheless that relational nature of deity is perfectly expressed *ad extra* by such creative action, that generous act of bringing into being a world which is the object of divine love (Polkinghorne 2007b, 112).

The internal relationality of God reaches its fullness in the perichoretic exchange between the persons of the Trinity which implies that the Divine creative activity is not motivated by any need to make this relationship complete. However, the relational nature of God manifests itself in a perfect manner to the outside through such an act of creation which brings forth the Universe as the object of the infinite love of God. Nicolaidis gives this truth more depth by asserting that:

> the relational mode of existence, which has been associated with creative growth, novelty, and free development, is qualified as *agape*. Agape then is something more than emotional state or sentimental experience, it is the very principle of existence: relating in a creative manner. *O theos agape esti* signifies that God is relationality and the whole exists as an endless and continuous manifestation of *agape*. Against the tides of modernity we may affirm the statement "SOCIATUS SUM, ERGO SUM" (Nicolaidis 2010, 106).

As the perfect union of the three, God is not a self-absorbed solitary entity, isolated and turned inward; rather, He consistently directs His actions outward in the act of creation. This implies that the Divine creative process always unfolds in complete freedom, and God is under no obligation or compulsion to create. As Wolfhart Pannenberg asserts: "If the world has its origin in a free act of God, it does not necessarily emerge

from the Divine being. It does not necessarily belong to the Divinity of God. It could also not exist" (Pannenberg 1991, 2:15). Despite its ontological dependence on God, however, the world was given the possibility of autonomous existence and action. In other words, the world was not only created out of love but also found a permanent space of existence "within" the infinitely generous and bountiful love of God. The world bears the mark of freedom because it is the work of a free and loving Creator. From the perspective of theology of science, this statement is important in that it leaves room in the world for both necessity and chance. Heller asserts: "chance is not a 'foreign body' in the structure of natural laws but its essential element" (Heller 2013, 179).

Danish historian of science Olaf Pedersen has keenly analyzed, from a historical perspective, the exact significance that the contingency of the Universe and its laws, resulting from a freely creating God, have for the scientific method. He articulated this issue by reaching out to the influence of two prominent medieval philosophers, Duns Scotus and William of Ockham, and their contributions to the origins of modern science. Pedersen points to two key implications of their works for the development of the scientific method. Firstly, this has to do with Ockham's concept of the *ordained power of God* (*potentia ordinata*) which greatly helped to confirm "the fundamental rationality" and the law-abiding nature of the Universe" (Pedersen 2007, 195). This, in turn, assured the legitimacy of the insight into the nature of the Universe by the study of the immanent regularities that govern its behavior. Secondly, while pondering the question of the contingency of the Universe, Scotus concluded that this contingency must have its source directly in the Divine will. Since the Divine act of creation of the Universe is free indeed, God could have a different set of laws as the foundation of its workings. If God had so willed, the Universe could be entirely other (e.g., Maurer 1982, 220–241). This means that the laws of nature cannot be deduced *a priori* as necessary emanations from the Divine essence but their discovery arises only *a posteriori* through carefully designed experiments. Therefore, the contingency of the Universe adds a newfound layer of understanding to the modern scientific method within the framework of the Trinitarian doctrine of creation.

The orderliness of the Universe ties most directly with Jesus Christ, the second person of the Trinity which in theology is commonly referred to as the Divine Logos. The orderliness of the Universe, in turn, means its rationality. As explained above, rationality is one of the most basic assumptions of the scientific method; however, its explanation lies entirely outside the competence of science. As Heller clearly points out, further inquiry belongs to theology of science (Heller 2003d, 47). Inspired by Pedersen (2007, 63–65), he concludes ,,that Christ is the Logos implies that God's immanence in the world is its rationality" (Heller 2003d, 57). While this assertion effects the closing of the epistemological gap proper to science thereby doing justice to the famous line of Einstein that "the eternal mystery of the world is its comprehensibility" (Einstein 1936, 351), it opens up a theological gap that is ultimately closed by the Trinitarian doctrine. In a nutshell, Christ as the Divine Logos emerges through an intellectual act with which God the Father understands Himself whereby the relation between the Father sharing the same Divine essence is established (Aquinas 1993, 35–41). Consequently, theology of science reaches its proper result.

To provide further support for the Trinitarian argument on contingency and orderliness of the Universe, and, ultimately, for the enhanced intelligibility of the scientific enterprise, one can reach out to the contemporary biblical scholarship on the interpretation of the Book of Genesis. In particular, the pertinent issue concerns the reading of Gen 1,1 where the Divine act of creation is stated with the use of the Hebrew verb ברא *bara: Bereshit bara Elohim* which means "In the beginning God created". Dutch biblical scholar Ellen van Wolde argues that the original meaning of the verb *bara* is not *to create* but to *spatially separate*, that is to shape something to its definite form (Wolde 2009). Although this meaning of *bara* is highly metaphorical, it conveys the idea of God creating the Universe with a specific set of principles that lie at its foundation. Interestingly enough, a derivative meaning of the verb *to hew* in English is to conform to certain rules and patterns. Based on these premises, the biblical argument supports the inference that the structure of the Universe and the laws that govern its dynamics is as a free choice proper the

creative activity of the Trinity. Moreover, Heller clearly stresses that the Universe, in which there would be no regularities or all possible regularities would reign at the same time, could not commence its existence because it would be plagued with contradictions (Heller 2006, 51).

5. Trinitarian ontology

In light of the Trinitarian doctrine, relationality is a key category that characterizes the innermost dynamics of the life of God as the unity of the three Divine persons. Moreover, the tradition of identifying the reflections of this relational dynamics within the created order reaches back to the works of Augustine and Thomas Aquinas and takes up the form of the famous dictum *vestigia trinitatis*. In other words, there exists a marked dependence of how the Universe is on how God is. For instance, Nicolas of Cusa asserts that: "res omnia creata gerit imaginem […] trinitatis" (de Cusa 1970, 9). As Woźniak points out, following the works of such theologians as Gustav Siewerth, Klaus Hemmerle and Clemens Kalliby this claim has acquired the name of the *Trinitarian ontology* (Woźniak 2015). The articulation of the centrality of the metaphysical concept of relationality in the account of the triune nature of God and the most fundamental ontology of the Universe opens up a unique space where theology and science can fruitfully meet.

The fact that the relationality of the internal dynamics of God finds its expression in the structure of the created order has been most extensively articulated by contemporary theologians involved in the dialogue between science and religion. Polkinghorne sees this relationality in the realm of physics:

> Modern science also encourages the use of relational concepts in its account of physical reality. The Newtonian picture of unchanging individual atoms colliding in the fixed container of pre-existing space has been replaced by Einstein's relativistic insight that space, matter and time are interlinked, by quantum theory's togetherness-in-separation (the EPR effect), and by the idea that all apparently individual electrons are actually excitations of energy in a common quantum field (Polkinghorne 1998, 133–114).

Interestingly enough, this belief reverberates in the voice of other influential theologians such as Walter Kasper as well (Kasper 1970, 310). Polkinghorne's observations find their corroboration in the ontological commitments of the realistic interpretation of the contemporary physical theories. An extensive line of argumentation exists in support of the *structural realism* according to which these are structures and not objects or substances that underpin the fundamental level of reality (Ladyman et al. 2009). These proposal go as far as to invoke highly abstract mathematical formalism of the *category theory* to represent these relations (Heller 2014). Denis Edwards makes special reference to the evolutionary biology by asserting that, similarly to physics, this discipline sees the entirety of objects in the Universe as deeply interconnected at all levels of reality from individual cells, through organisms, ecosystems to planetary communities (Edwards 1999, 24–28). Together with the philosophical implications of the theoretical physics, this branch of biology contributes to the general belief that the Universe is not a simple mechanistic sum of its parts but constitutes a network of highly complex relations and the holistic view of the Universe with the abundance of emergent structures and properties is more fitting at this point.

In addition to the mere statement of the ubiquity of relationality in the world described by biology, Edwards offers two important philosophical remarks that are highly pertinent to theology of science. In the first of them he engages in a deeper consideration of what indeed may be the cause of why objects and structures come into existence. He advances a strong metaphysical conclusion that because the Triune God is relational, relationality is the very foundation of existence in the Universe. In other words, the commencement of being means entering into relation rather, as classically maintained, becoming an independently existing substance. In his metaphysical reflections, Edwards remarkably approaches Heller's thesis, formulated within the realm of theoretical physics, which posits that the essential condition for existence is mathematicity (Heller 2006). This alignment arises from the acknowledgment that, by considering mathematics as the science of structures, mathematicity and relationality can be used interchangeably. In the second

remark Edwards acknowledges that there is an infinite gap between the relationality within the created order and the Divine communion. This, in turn, leads to an epistemological issue referred to by Polkinghorne as "veiled reality" because, much like in case of quantum mechanics, the understanding of the nature of the triune God calls for the use of counterintuitive conceptual frameworks which do not necessarily match those applicable to the study of everyday phenomena in the macroscopic world (Polkinghorne 2004, 76–78; see also Heller 2003c).

While the philosophical reflection on the outcomes of contemporary science favors the fundamental relationality of the universe to underscore its unity, there remains a need for an argument to account for the real, rather than apparent, diversity of things in the Universe. In other words, what was self-evident in the ontology of substances, now requires separate justification. It can be formulated based on an incisive observation of Panos A. Ligomenides who refers to a non-trivial property of physical reality termed by him "locality of presence in space and time". This property consists in that every relation in physics that appears as the "field of force" reveals "locality" in the sense that the field is quickly attenuated with increasing distance or the passage of time. As a result, the approximate delimiting of objects and processes takes place indicating that their approximate autonomy and identification as physically real and not apparent entities is possible. Otherwise, "the interpenetrating interaction of things would make it impossible to know something without knowing everything" (Ligomenides 2010, 83). This outcome carries important consequences for the exercise of the scientific method as such because it explains why by applying the method locally at a certain point in space and time and to concrete physical objects researchers acquire reliable knowledge of the laws that govern their structure and dynamics. This inference is greatly complemented by the hypothesis of the *field of rationality* proposed separately by Życiński and Heller (Heller 1997, 238; Życiński 1987) [1]. In light of this hypothesis, concrete objects instantiate the abstract laws latent in this field. Consequently, the scientific method

[1] For a summary in English see (Grygiel 2022; Heller 1997, 238; Życiński 1987).

receives another dimension of intelligibility as the foundation of its functioning can be traced back to the truine God being the principle of unity and diversity.

Conclusions

The value of theology of science consists in that it establishes a new dimension of interaction between science and theology in which theology turns out to be helpful in making the Universe intelligible to those who are part of the Universe and who share with it their history. While one may generally concur with Michael Heller that theology of science, as a valid theological discipline, should primarily enhance theology, this study has confirmed that the scope of this discipline thus defined is too restrictive and the enrichment works in both directions: from science to theology and from theology to science. The considerations carried out within this study have demonstrated that the reference to the Triune God as the creator of the Universe sheds unique light not only on the nature of the Universe as a contingent being but on the method of science capable of acquiring reliable knowledge on the Universe's structure and dynamics. Moreover, the ontological aspect of theology of science in the Trinitarian perspective surveyed in this study has demonstrated a unique nexus of theology and science because both the Divine reality and the physical reality turn out to be fundamentally relational. Thus relationality establishes a unique link between realities otherwise considered as entirely distinct thereby opening new vistas for the fruitful dialogue between science and theology.

It is not hard to notice that the ontological aspect of the Trinitarian perspective in theology of science taken up in this study considers the fundamental relationality of the Universe in a very general way only without making proper distinctions refracting the different levels of complexity in nature. While some of them were briefly signaled by referring to relationality on the level of biology and sociology, the embedment of theology of science in the context of the Trinitarian doctrine opens up unique opportunities for exploring the theological significance of the the

most complex products of the dynamics of the Universe with the human species exhibiting by far the highest degree of complexity. In particular, this concerns theological anthropology and one of its key tenets, namely, the creation of man as the *imago Dei*. While classical approaches locate this image within the cognitive capabilities of man such as reason and self-consciousness, the Trinitarian theology of science seems to warrant another dimension of our likeness to the Trinune God in the form of our capacity for altruism through which we imitate the Trinitarian dynamics by our disposition to offer our lives for the good of others. However, further investigations with rich reference to contemporary cognitive science must be carried out in order to substantiate this inference.

References

Aquinas, Saint Thomas. 1993. *Light of Faith: The Compendium of Theology*. Reprint edition. Manchester, N.H: Sophia Institute Press.

Barbour, Ian G. 1974. *Myths, Models and Paradigms: Nature of Scientific and Religious Language*. London: SCM-Canterbury Press Ltd.

Barbour, Ian G. 1997. *Religion and Science: Historical and Contemporary Issues*. New York: Harper Collins Publishers.

Barbour, Ian G. 2016. *Mity. Modele. Paradygmaty. Studium porównawcze nauk przyrodniczych i religii*. Kraków: Copernicus Center Press.

Byrne, Peter. 1995. "Theology and Scientific Understanding." In *Companion Encyclopedia of Theology*, edited by Peter Byrne and Leslie Houlden. London and New York: Routledge.

Dadaczyński, Jerzy. 2015. „O niektórych (możliwych) obszarach badań teologii nauki." In *Teologia nauki*, edited by Janusz Mączka and Piotr Urbańczyk, 75–95. Kraków: Copernicus Center Press.

de Cusa, Nicolas. 1970. "De Pace Fidei." In *Nicolai de Cusa Opera Omnia*, edited by Ramond Klibansky and Bascour Hildebrand. Vol. 7. Hamburg: Felix Meiner Verlag.

Edwards, Denis. 1999. *The God of Evolution: A Trinitarian Theology*. Paulist Press.

Einstein, Albert. 1936. "Physics and Reality." *Journal of the Franklin Institute* 221(3): 349–82. DOI: http://dx.doi.org/10.1016/S0016-0032(36)91047-5.

Evers, Dirk. 2017. "Creation and Contingency." In *Oxford Research Encyclopedia of Religion*. DOI: http://dx.doi.org/10.1093/acrefore/9780199340378.013.35.

Greshake, Gisbert. 1996. “Trinität als Inbegriff des christlichen Glaubens.” In *Christlicher Glaube in der Begegnung mit dem Islam*, edited by Andreas Bsteh, 327–42. Mödling: Verlag St. Gabriel.

Greshake, Gisbert. 1997. *Der dreieine Gott: Eine trinitarische Theologie*. Freiburg im Breisgau Basel Wien: Herder.

Grygiel, Wojciech P. 2018. “In What Sense Can the Scientifically Driven Theology Be Considered as a Continuation of the Doctrinal Tradition?” *Theological Research. The Journal of Systematic Theology* 6: 31–52.

Grygiel, Wojciech P. 2022. “A Critical Analysis of the Philosophical Motivations and Development of the Concept of the Field of Rationality as a Representation of the Fundamental Ontology of the Physical Reality.” *Philosophical Problems in Science (Zagadnienia Filozoficzne w Nauce)* 72: 87–108.

Heller, Michał. 1992a. *Nowa fizyka i nowa teologia*. Tarnów: Biblos.

Heller, Michał. 1992b. “Program teologii nauki.” In *Nowa fizyka i nowa teologia*, edited by Michał Heller, 116–18. Tarnów: Biblos.

Heller, Michał. 1996a. *The New Physics and a New Theology*. Vatican: Vatican Observatory.

Heller, Michał. 1996b. “A Program for Theology of Science.” *Studies in Science and Theology* 4: 41–4.

Heller, Michał. 1997. *Uchwycić przemijanie*. Kraków: Wydawnictwo ZNAK.

Heller, Michał. 2003a. “A Program for Theology of Science.” In *Creative Tension: Essays on Science and Religion*, edited by Michał Heller, 29–32. Philadelphia – London: Templeton Foundation Press.

Heller, Michał, ed. 2003b. “Science and Faith in Interaction.” In *Creative Tension: Essays on Science and Religion*, 153–161. Philadelphia–London: Templeton Foundation Press.

Heller, Michał. 2003c. Chaos, “Probability and the Compressibility of the World.” In *Creative Tension: Essays on Science and Religion*, edited by Michał Heller, 127–143. Philadelphia–London: Templeton Foundation Press.

Heller, Michał. 2003d. “Scientific Rationality and Christian Logos.” In *Creative Tension: Essays on Science and Religion*, edited by Michał Heller, 47–57. Philadelphia–London: Templeton Foundation Press.

Heller, Michał. 2003e. “Generalizations: From Quantum Mechanics to God.” In *Creative Tension: Essays on Science and Religion*, edited by Michał Heller, 100–26. Philadelphia–London: Templeton Foundation Press.

Heller, Michał. 2006. “Czy świat jest matematyczny?” In *Filozofia i wszechświat*, edited by Michał Heller, 48–57. Kraków: Universitas.

Heller, Michał. 2013. *Philosophy of Chance: A Cosmic Fugue with a Prelude and a Coda*. Translated by Rafal Smietana. Kraków: Copernicus Center Press.

Heller, Michał. 2014. "The Field of Rationality and the Category Theory." In *Mathematical Structures of the Universe*, edited by Michał Eckstein, Michał Heller, and Sebastian J. Szybka, 441–57. Kraków: Copernicus Center Press.

Heller, Michał. 2015. „Wstęp do teologii nauki." In *Teologia nauki*, edited by Janusz Mączka and Piotr Urbańczyk, 13–22. Kraków: Copernicus Center Press.

Heller, Michał. 2019a. *Nauka i teologia: niekoniecznie tylko na jednej planecie*. Kraków: Copernicus Center Press.

Heller, Michał. 2019b. "How Is Philosophy in Science Possible?" *Philosophical Problems in Science (Zagadnienia Filozoficzne w Nauce)* 66: 231–49.

Heller, Michał. 2021. *Bóg i geometria: Gdy przestrzeń była Bogiem*. 1st edition. Kraków: Copernicus Center Press.

Jaeger, Lydia. 2010. "The Contingency of Laws of Nature in Science and Theology." *Foundations of Physics* 40(9): 1611–24. DOI: http://dx.doi.org/10.1007/s10701-010-9470-y.

Jaeger, Lydia. 2018. "The Contingency of Creation and Modern Science." *Theology and Science* 16 (1): 62–78. DOI: http://dx.doi.org/10.1080/14746700.2017.1413813.

Jaki, Stanley L. 1979. *Origin of Science and the Science of Its Origin*. First Edition. South Bend, Ind: Regnery Gateway.

Jaki, Stanley L. 1990. *Savior of Science*. Edinburgh: Scottish Academic Press Ltd.

Kasper, Walter. 1970. *The God of Jesus Christ*. New York: Paulist Press.

Kehl, Medard. 2006. *Und Gott sah, dass es gut war: Eine Theologie der Schöpfung*. 2nd ed. Freiburg im Breisgau: Verlag Herder.

Knauer, Peter. 1986. *Unseren Glauben Verstehen*. Würzburg: Echter.

Küng, Hans, and Heinrich von Stietencron. 1999. *Christentum Und Weltreligionen. Hinduismus*. München–Zürich: Pieper.

Ladyman, James, Don Ross, David Spurrett, and John Collier. 2009. *Every Thing Must Go: Metaphysics Naturalized*. 1st edition. Oxford, New York: Oxford University Press.

Ligomenides, Panos A. 2010. "Scientific Knowledge as a Bridge to the Mind of God." In *The Trinity and an Entangled World: Relationality in Physical Science and Theology*, edited by John Polkinghorne, 227. Grand Rapids, MI: Wm. B. Eerdmans Publishing Co.

Macek, Wiesław M. 2010. *Teologia nauki według księdza Michała Hellera*. Warszawa: Wydawnictwo Uniwersytetu Kardynała Stefana Wyszyńskiego.

Mączka, Janusz, and Piotr Urbańczyk, eds. 2015. *Teologia nauki*. Kraków: Copernicus Center Press.

Maurer, Armand Augustine. 1982. *Medieval Philosophy*. Toronto: Pontifical Institute of Medieval Studies.

Maziarka, Tomasz. 2016. „W stronę teologii nauki – na kanwie myśli ks. prof. Michała Hellera." *Tarnowskie Studia Teologiczne* 35(1): 7–18. DOI: http://dx.doi.org/10.15633/tst.1711.

Murphy, Nancey. 1993. *Theology in the Age of Scientific Reasoning*. First Edition. Ithaca, NY: Cornell University Press.

Nicolaidis, Argyris. 2010. "Relational Nature." In *The Trinity and an Entangled World: Relationality in Physical Science and Theology*, edited by John Polkinghorne, 93–106. Grand Rapids, MI: Wm. B. Eerdmans Publishing Co.

Pannenberg, Wolfhart. 1991. *Systematische Theologie*. Vol. 2. Göttingen: Vandenhoeck & Ruprecht.

Peacocke, Arthur R. 1993. *Theology for a Scientific Age: Being and Becoming – Natural, Divine and Human*. Minneapolis: Fortress Press.

Peacocke, Arthur R. 2004. "Articulating God's Presence in and to the World Unveiled by the Sciences." In *In Whom We Live and Move and Have Our Being: Panentheistic Reflections on God's Presence in a Scientific World*, edited by Philip Clayton and Arthur R. Peacocke, 137–54. Grand Rapids, MI – Cambridge, UK: William B. Eerdmans Publishing Company.

Pedersen, Olaf. 2007. *Two Books: Historial Notes on Some Interactions Between Natural Science and Theology*, edited by George V. Coyne S.J and Sierotowicz Tadeusz. 1st edition. Vatican: Vatican Observatory.

Polkinghorne, John. 1998. *Science and Theology: An Introduction*. London–Minneapolis: SPCK, Fortress Press.

Polkinghorne, John. 2004. *Science and the Trinity: The Christian Encounter with Reality*. First Edition. New Haven: Yale University Press.

Polkinghorne, John. 2007a. *Quantum Physics and Theology: An Unexpected Kinship*. London: Society for Promoting Christian Knowledge.

Polkinghorne, John. 2007b. *Exploring Reality: The Intertwining of Science and Religion*. First Edition. New Haven (Conn.): Yale University Press.

Polkinghorne, John. 2010a. "The Demise of Democritus." In *The Trinity and an Entangled World: Relationality in Physical Science and Theology*, edited by John Polkinghorne, 1–14. Grand Rapids, MI: Wm. B. Eerdmans Publishing Co.

Polkinghorne, John, ed. 2010b. *The Trinity and an Entangled World: Relationality in Physical Science and Theology*. Grand Rapids, MI: Wm. B. Eerdmans Publishing Co.

Ratzinger, Joseph. 2004. *Introduction to Christianity*. San Francisco: Ignatius Press.

Russell, Robert J. 2000. "Quantum Physics in Philosophical and Theological Perspective." In *Physics, Philosophy, and Theology: A Common Quest for Understanding*, edited by Robert John Russell, William R. Stoeger, and George V. Coyne, 343–74. Vatican City State: University of Notre Dame Press.

Simmons, Ernest L. 2014. *The Entangled Trinity: Quantum Physics and Theology*. Fortress Press. Minneapolis, Minn: 1517 Media.

Walker, Ralph C.S. 2016. "Contingency." In *Routledge Encyclopedia of Philosophy*, 1st ed. London: Routledge. DOI: http://dx.doi.org/10.4324/9780415249126-N008-1.

Ware, Kallistos. 2010. "The Holy Trinity: Model for Personhood-in-Relation." In *The Trinity and an Entangled World: Relationality in Physical Science and Theology*, edited by John Polkinghorne, 107–29. Grand Rapids, MI: Wm. B. Eerdmans Publishing Co.

Wegter-McNelly, Kirk. 2011. *The Entangled God: Divine Relationality and Quantum Physics: 15*. 1st edition. London: Routledge.

Wolde, Ellen Van. 2009. "Why the Verb אדב Does Not Mean 'to Create' in Genesis 1.1-2.4a." *Journal for the Study of the Old Testament* 34(1): 3–23.

Woźniak, Robert J. 2015. „Modele z nauk ścisłych we współczesnej teologii trynitarnej." In *Teologia nauki*, edited by Janusz Mączka and Piotr Urbańczyk, 377–407. Kraków: Copernicus Center Press.

Życiński, Józef. 1987. „Filozoficzne aspekty matematyczności przyrody." In *Filozofować w kontekście nauki*, edited by Michał Heller, Alicja Michalik, and Józef Życiński, 170–85. Kraków: Polskie Towarzystwo Teologiczne.

Życiński, Józef. 2014. *Transcendencja i naturalizm*. 1st edition. Kraków: Copernicus Center Press.