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# In Serach of Understanding : Can Science and Theology Both Contribute to a Coherent Worldview?

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# IN SEARCH OF UNDERSTANDING: CAN SCIENCE AND THEOLOGY BOTH CONTRIBUTE TO A COHERENT WORLDVIEW?

**Abstract**. The paper, drawing on ancient ideals of knowledge: pure versus practical, argues that natural sciences cannot provide a real *worldview* by themselves. This is because they have features such as ambiguity of the scientific description of reality, meaninglessness of mathematical models employed, and non-referential character of many important scientific notions. This would leave the human desire to *understand* the world unfulfilled, if other sources of knowledge are excluded. But if they are allowed, then a proper way of reconciling independent or even seemingly divergent views has to be found. Among complementary sources of a worldview, many accept religion, or rather the rational reconstruction of religious beliefs – theology. This paper suggests that some important concepts found in the contemporary philosophy of science – among them underdetermination and incommensurability – point to ways which may allow for the provision of methodologically acceptable constructs, based on the two pillars – science and theology; constructs, which could go beyond vague metaphors towards a consistent worldview.

**Keywords**: incommensurability, Inter-Theoretic Relations theory, mathematical models in science, postulated ontology, pure knowledge, reference in science, Science-and-Religion, Science-and-Theology, underdetermination, worldview



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Theology and the Inter-Theoretic Relations. 4.1. Science-and-Theology: general goal. 4.2. Science-and-Theology: particular aims. 5. Conclusion.

## 1. INTRODUCTION

Understanding the world we live in has always been one of the most important human desires, driving our cognitive efforts since the dawn of thought. Adequate knowledge of the world has obvious practical advantages and may have contributed to evolutionary success of *Homo sapiens*. But a look at the history of human thought suggests that apart from this practical dimension of knowledge, mankind has always cherished also such attempts at understanding of the world, which would allow for a construction of a worldview – for such a grasp of reality that fulfils our cognitive ambitions: to know who we are, and what exactly the world we live in looks like. It is widely acknowledged that the first providers of such a worldview were ancient religious ideas, which however, still in antiquity, were replaced by rational reflection, later called philosophy. This, it turn, had to give way – in modern times – to science, and today, if we want to understand the world, it is in science where we may hope to find answers to our questions about the world.

If this linear account of the history of human efforts to grasp reality (religion – philosophy – science) is correct, than the question of other than scientific sources of the worldview is empty: nowadays there is no need of looking for valuable knowledge outside of the scientific realm. Those who hold some religious convictions, while also respecting the achievements of science, may feel the need for some sort of unification of scientific knowledge and their religious views. But if "science is the measure of all things, of what is that it is, and of what is not that it is not"[1], if "the natural world is exhausted by all the physical facts, (...) there is nothing else in nature"[2], then religion (together with systematic

[1] W. Sellars, *Empiricism and the Philosophy of Mind*, in: Idem, *Science, Perception and Reality*, Routlege, London 1963, 173.

[2] B. Stroud, *The Charm of Naturalism*, in: *Naturalism in Question*, ed. M. de Caro, D. Macarthur, Harvard University Press, Cambridge Mass. – London 2004, 27.

reflection on religious convictions offered in theology) has to be left in the irrational sphere of an individual outlook-on-life, while true knowledge and understanding has to be sought in science alone. Is this, however, an adequate account of acceptable sources of our knowledge?

The first part of the paper will challenge the view that science provides such understanding of the world which could be accepted not only as a set of tools convenient for practical purposes, but also as a proper worldview. It will be demonstrated that certain features of scientific theories make the hope of finding the desired answers to the question of what the world really looks like in science alone unfulfilled. This basically opens up a possibility that other sources can contribute to our understanding of the world. If, in turn, among these sources one allows theology, then the question arises how to construct a consistent worldview based on such diverse sets of convictions. This question will be considered in the second part of the paper. Since the task of somehow relating science and theology is being undertaken in the growing discipline called usually *Science-and-Religion*, this part offers considerations that may be seen as a preliminary attempt to point to proper methodology of this discipline.

## 2. SCIENTIFIC WORLDVIEW: WHAT IS IT, OR COULD BE?

The meaning of the expression used in the title of this section needs some clarification. While 'worldview' stands for generalized, but possibly comprehensive knowledge about the world, the adjective 'scientific' points to methods of achieving such knowledge. Therefore 'scientific worldview' is knowledge of the world offered by science. This, of course, is not a definition, but rather a general, intuitive description of what is meant here by that expression. In trying to make it a bit more precise, let's consider briefly the crucial term used in that description: 'knowledge'.

An important distinction with this respect was introduced already in antiquity. When considering sensual perception Aristotle wrote that senses "are indeed our chief sources of knowledge about particulars, but they do not tell us the reason for anything, as for example why fire is hot, but only that it is hot. It is therefore probable that at first the inventor of any art which went further than the ordinary sensations was admired by his fellow-men, not merely because some of his inventions were useful, but as being a wise and superior person"[3]. The distinction in question is that between pure and practical knowledge: "(…) if it was to escape ignorance that men studied philosophy, it is obvious that they pursued science for the sake of knowledge, and not for any practical utility. (…) Clearly then it is for no extrinsic advantage that we seek this knowledge; for just as we call a man independent who exists for himself and not for another, so we call this the only independent science, since it alone exists for itself"[4].

Practical knowledge is when one wants to know what *to do* in order to achieve a particular goal. For example, to preserve my food, to prevent it from getting spoiled, I do not have to know *why* and *how* the refrigerator works. The only thing I need to know is *that* it works: that certain action on my part will bring the desired outcome, and in doing so I do not need any *explanation*. Moreover, even if some explanation is provided, the prescribed action will succeed, not because I think I know the intrinsic workings of the world, but rather regardless of such 'knowledge'. When I hear thunder I may 'explain' the sound by postulating that Zeus has just shut the door of his heavenly bathroom and is about to take a shower. In a few minutes, therefore, I may expect to experience the results of his ablutions – that, which people call rain – and look for a shelter to prevent myself from getting wet[5]. I can take appropriate action regardless of the plausibility of my explanation. This shows an important feature of practical knowledge: *any* explanation is good as long as it makes me take practically rewarding decisions, if by applying such an explanation I may achieve my goal. Explanation is irrelevant to the aim of practical knowledge.

[3] Aristotle, *Metaphysics*, transl. H. Tredennick, Harvard University Press – William Heinemann Ltd., London – Cambridge MA 1989, 981b.

[4] Ibid., 982b.

[5] This is a slightly modified example given by R. Dunbar, *The Trouble with Science*, Faber & Faber Ltd, London 1995, 56.

Pure knowledge, in turn, is when one wants to know *really*, to have sound answers to the why and how questions, to have an explanation worthy of its name. The term 'worldview', adopted in this paper, denotes such knowledge. In trying to make this quite often used but vague term a bit more precise, we may say that what consists of a worldview are well-supported convictions that certain things really exist, and certain phenomena really occur. In such a perspective, the question what *scientific* worldview is, becomes the question if contemporary science supplies us with pure knowledge – as opposed to practical knowledge, where the latter, given the success of science, appears quite obvious.

## 3. SCIENTIFIC DESCRIPTION OF REALITY

This section will focus on four characteristic features of scientific description of reality, which suggest that the answer to the question if science is a provider of pure knowledge has to be negative: 1) pure scientific description of a given phenomenon is not unique, 2) important notions used in scientific theories have no apparent designates, 3) scientific mathematical models are, in an important sense, meaningless, and – an obvious, but sometimes underestimated feature of science: 4) scientific theories are hypothetical.

### 3.1. AMBIGUOUS MODELS IN SCIENCE

There are many instances in science, where the same phenomenon can be described with the use of different models, distinct in their important, theoretical details, yet equivalent with regard to empirical predictions. Two models are empirically equivalent when the sets of their empirical consequences are identical[6]. In such a case, a phenomenon being described in the two models does not, and fundamentally cannot,

[6] Possible definitions of the notion of 'empirical equivalence' are numerous. E.g.: "Two theories are empirically equivalent if they share all consequences expressed in purely observational vocabulary". J. Worrall, *Underdetermination, realism and empirical equivalence*, Synthese 180(2011)2, 157. An analysis of the details and possible variations of these definitions is, however, unnecessary for the purpose of this paper.

impose the choice of one of the models over the other; this theoretical choice is transparent to any empirical evidence.

One of the simplest examples of theoretical ambiguity can be found in the Coulomb's law describing the electrostatic interaction between electrically charged particles, superseded by the electric field equation. The former model employs the idea of two charged particles interacting with each other at some distance and hence producing electric force acting between them. The other uses the notion of the electric field, which exercises an electric force on a particle. Empirical predictions of both are exactly the same, and the choice of a model when describing relevant phenomena is the matter of convenience. But while the first speaks of particles and their specific feature called charge, the other suggests that space, in the presence of an electric charge, gains a specific property, which is described in terms of an electric field. Those driven by an ambition to know 'really' may feel tempted to ask a question whether such a thing like the electric field really exists or not, if the notion of such a field appears in one of the two equivalent models and does not appear in the other. Although this question, from purely scientific point of view, would be rendered meaningless or even naïve, the ideal of 'pure knowledge' requires that we have sound reasons to acknowledge that certain things exist in the real world and have – or do not have – certain features. The ambiguity of scientific models shows that science cannot answer such questions by itself.

### 3.2. THE PROBLEM OF REFERENCE

The well-known realist position with regard to scientific notions is that terms used in (sufficiently developed) theories and disciplines of science are referential: they refer to external reality and denote real objects or phenomena[7]. But the history of science challenges this view.

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[7] There are many different formulations of "scientific realism", but all of them usually agree that "entities existing in the world can be described by our theoretic terms". M. Karaba, *Realistic Interpretations of Scientific Knowledge in Theistic Contexts*, in: Studies in Science and Theology 11(2007–2008): *Humanity, the World and God: Understandings and Actions*, ed. W.B. Drees, H. Meisinger, T.A. Smedes, Lund University, Lund 2007, 168.

An interesting lesson can be learned in this respect from the formulation and explanation of the law of definite proportions (or the law of constant composition), which at the end of the 18th century became the cornerstone of modern chemistry. The law states that all samples of a given chemical compound have the same elemental composition by mass[8]. But why should it be like that? This question finds quite an obvious answer in the atomic theory of matter – in fact, the law in question is believed to contribute to the subsequent formulation of the early atomic theory by John Dalton in the beginning of the 19th century: nature behaves like this because there exists the smallest possible portion of each element, and therefore elements cannot combine in random proportions. What is significant here, however, is that atomism, implied by the law of definite proportions, had long way to go to be accepted by scientific community, and was being rejected by some notable scientists still in the 20th century. This was possible because the law works independently of any kind of *explanation*. Explanation, therefore, is not a part of a scientific theory, but something beyond it, additional, and not definite. The fact that atomism properly explains certain phenomena (in our case: it explains why nature behaves according to the law of definite proportions) does not imply that atoms really exist. The conviction that they do is based on a conditional: if matter consists of atoms, then it has to behave in a certain way. Of course, in this type of reasoning, if the consequent is true, then the antecedent is probable, but not proven.

The simple example here is not meant as a discussion on the plausibility of atomism – the conviction that atoms exist can be nowadays supported in many different ways – but it points to a general feature of scientific description of reality: the notions used in this description are of theoretical character; the question whether they refer to real beings or not is open, and cannot be answered ‘from within’ science alone.

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[8] This law, originally proposed by the French chemist Joseph Proust, was at first contested by others, arguing that elements can combine in any proportion. The controversy was later resolved in the distinction between pure compounds and mixtures – the Proust’s law works with regard to the former.

### 3.3. MEANINGLESS MATHEMATICAL MODELS

The application of mathematics in scientific research is believed to be one of the key factors in the origins and development of modern science. Some postulate also that as long as a given discipline does not develop sufficiently advanced mathematical tools, it cannot be regarded as a mature branch of science. Even if such a demand is exaggerated, it can hardly be denied that the use of mathematical models boosts the predictive power of science. Such models are used in many branches of scientific research, and particularly in physics they are indispensable. Because physics can be regarded as a fundamental scientific discipline[9], its intrinsic dependence on mathematical tools seems to suggest that mathematics provides a truly exceptional insight into the workings of nature[10]. However, are we able to come closer to the desired *pure* knowledge about the world by the use of mathematical models, or are they important, but just practical predictive tools?

In a certain important sense mathematical models as such are meaningless – they do not have any particular 'content', any definite relation to reality. The same model may be applied to describe phenomena of very different nature. An example of this is the so-called harmonic oscillator. In itself it is nothing more than a differential equation, which

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[9] This is not to imply any form of physicalism (reductionism demanding that all scientific disciplines should be reduced – in their methods, accepted modes of explanation, or otherwise – to physics), which is not discussed in the paper, and at least in its most radical formulations is an implausible position – cf. H. Putnam, *The Content and Appeal of "Naturalism"*, in: *Naturalism in Question*, eds. M. de Caro, D. Macarthur, Harvard University Press, Cambridge Mass – London 2004, 66–70. But it can hardly be denied that physics does deal with fundamental phenomena in the material world.

[10] For some authors the consequences of the "unreasonable effectiveness of mathematics" (as it reads the title of a famous paper by E.P. Wigner, *The Unreasonable Effectiveness of Mathematics in Natural Sciences*, Communications on Pure and Applied Mathematics 13(1960)1, 1–14) reach as far as to a platonic claim that nature is intrinsically mathematical. This thesis has been widely discussed and many objections raised – e.g. S. Wszołek, *Matematyka i metafizyka. Krótki komentarz na temat hipotezy matematyczności świata*, Studia Philosophiae Christianae 46(2010)1, 25–36; A. Lemańska, *Matematyczność czy matematyzowalność przyrody?*, Studia Philosophiae Christianae 49(2013)3, 5–24. Although this thesis as such is not discussed here, the following considerations offer some observations that seem to call it into doubt.

is used to describe various, physically different phenomena: from the motion of certain mechanical systems to the flux of electric charge in a circuit. This, of course, is a great advantage of such models, because it allows for the accounting for many different phenomena by solving just one equation. But it is equally obvious that such a model cannot contain any peculiar knowledge about a particular phenomenon – for precisely the same reason which makes it so useful in various practical purposes: the lack of any definite, unequivocal relation to natural beings.

Another problem, with the hope that mathematical models used in science can bring the desired knowledge of the world, stems from unavoidable difficulties in solving appropriate equations. Many of those models – like the one mentioned above – have a form of differential equations. If such an equation has an analytical solution, then a particular function obtained may be regarded as representing some natural regularity. Unfortunately, the class of differential equations that can be explicitly solved is quite restricted[11]. In many cases, standard analytical methods fail, and what is left is a possibility to find an approximate numerical solution in a *particular* case of given parameters. This has a practical, predictive value in single cases, but a *general* account of natural regularities is missing from the picture.

### 3.4. HYPOTHETICAL KNOWLEDGE

It is a commonplace that theories in natural sciences are and ever will be hypothetical. While this usually does not jeopardize their practical usefulness – as long as the scope of application of such a theory is sufficiently clear – their value as providers of 'pure knowledge' of nature can be call into doubts. Let us illustrate this point with yet another example, this time taken from protobiology – the theories of the origin of life.

There are many models of the precellular, abiotic evolution[12]. They show how from simple components, which could be found in the pri-

[11] This is why simplified models are introduced "for mathematical purposes because the equations of the realistic theory are too difficult to solve even approximately". R. Newton, *Thinking about physics*, Princeton University Press, Princeton 2000, 67.

[12] W. Ługowski distinguishes about 150 such models that have been proposed in the last 50 years. W. Ługowski, *Filozoficzne podstawy teorii biogenezy. Kontrowersje*

mitive atmosphere and in the primordial ocean on Earth, complex cell--like structures could evolve. Such models can be verified in laboratory experiments, confirming a possibility that certain processes could occur some billion years ago on Earth. It does not mean, however, that such a process had to occur at all. The hypothetical character of scientific knowledge here reveals its general, and not only particular aspect: the latter is just this commonplace conviction that, in principle, science will never be able to choose between the competing accounts of the natural origins of life. But there is more at stake: what we have here is a specific conditional: if prebiotic evolution took place in the past history of our planet, then the mechanisms of this evolution can be described in terms of one model or another. But none of these models, even if empirically confirmed as a possibility, is a 'proof' that living systems must have evolved from a mixture of simple unanimated components. That they could have, is an assumption without which protobiology would be a meaningless endeavour. But even numerous attempts to describe possible details of this process leave the more fundamental question unanswered: what if the abiotic evolution remains only a postulate, and the true account of the origin of life has to be sought elsewhere?[13]

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Practical reliability of scientific knowledge leads often to the conviction that science provides ultimate knowledge of reality: 'science must be for real because aircraft fly'. This pragmatism is deeply rooted in our scientific culture[14]. However, the fact that 'science works' may

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*rzeczywiste i pozorne*, in: *Współczesne kontrowersje wokół początków Wszechświata i początków życia* (*Filozoficzne i naukowo-przyrodnicze elementy obrazu świata*, t. 8), ed. A. Lemańska, A. Świeżyński, Wyd. UKSW, Warszawa 2010, 187.

[13] The well-known candidates are panspermia in its various forms or a special act of divine creation. It's not that these alternatives are more plausible that the hypothesis of the earthly abiogenesis. But it shows that science alone does not provide the ultimate answer to the question of the origin of life.

[14] Cf. J. Ziman, *Real Science. What it is, and what it means*, Cambridge University Press, Cambridge 2000, 317–318.

contribute to the delusion that it actually *explains* something[15]. The four characteristics of the scientific description of reality, which have been discussed here, show that the task of constructing a worldview cannot be left to natural sciences alone. Science seems incapable of producing 'pure knowledge', of fulfilling the ideal of 'to know in order to know', as opposed to 'to know in order to use'. Regardless of unmistakable successes of science, one should rightly be cautioned "against assuming that our laws and theories are intrinsic parts of nature, rather than our way of describing and understanding what is out there"[16].

Aristotle thought that only pure knowledge is worthy of its name: "(...) among the sciences we consider that science which is desirable in itself and for the sake of knowledge is more nearly Wisdom than that which is desirable for its results, and that the superior is more nearly Wisdom than the subsidiary (...)"[17]. If in search of such a 'superior' worldview it appears advisable, or even necessary, to be open to other than scientific sources of knowledge – for example philosophy, or, indeed, religion – it raises the question of how to harmonize such divergent views into a coherent picture.

## 4. SCIENCE-AND-THEOLOGY AND THE INTER-THEORETIC RELATIONS

Relations between science and theology are commonly described in such terms as 'conflict', 'independence', 'dialogue', and 'integration'. Although such an approach proved to be very useful and successful in science – theology debate, the notions mentioned above apply – strictly speaking – more to human relations than to scientific and theological theories. Therefore the task of finding a more appropriate tool for proper description of the relations in question remains open.

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[15] Cf. R. Newton, op. cit., 20–22.

[16] Ibid., 31. It may be true that a „natural and convincing explanation of the success of science is the fact that it achieves increasingly better grasp of reality". J. Polkinghorne, *One world: The interaction of science and theology*, Princeton University Press, Princeton 1986, 22. This grasp however does not seem to go beyond, broadly understood, practical applications.

[17] Aristotle, *Metaphysics*, 982a.

This section of the paper considers the possibility of applying the theory of *Inter-Theoretic Relations* (ITR), which is being developed in the modern philosophy of science, as such a tool. This theory is basically used in the methodology of natural sciences and may seem to be restricted to the domain of empirically verifiable proposals. However, if the thesis of underdetermination of scientific theories by empirical data holds, other, non-empirical criteria have to be applied when it comes to the comparison of various theories. This problem becomes more apparent when two theories have the same object, but differ significantly in their explanations.

The ITR theory searches for such non-empirical criteria and offers interesting categories, like incommensurability, which opens up a possibility of applying this theory in a broader context – perhaps also with regard to the relations between science and theology. The task of examining this possibility is especially important for those particular issues in the science – theology debate, where the two disciplines do seem to offer different or even mutually exclusive worldviews.

The interdisciplinary area of *Science-and-Theology* has undoubtedly gained its position among other academic disciplines over past years. Many renowned scholars, who pursue their research in this field all over the world, as well as a number of scholarly organizations, can be seen as a practical proof of that. However any discipline, which aspires to be recognized as fully belonging to the academic world, has to have proper methodology. This is one of the most important features which differentiate science (in a broader sense of this word) from pseudo-science; to show rational methods according to which one may conduct their research is to prove that such an enterprise may yield more than personal, subjective views or 'stories' appealing only to their author.

The need to find suitable methodology for *Science-and-Theology* seems important indeed, given the fact that solutions to particular problems offered within this area, not too often go beyond oversimplified analogies – like the one between biblical statement that 'God is Light' and Maxwell's theory of electrodynamics[18].

There are basically two approaches to the problem of formulating proper methodology of a given discipline. According to classical proposals, *before* any particular statement, a solution to any problem raised within a certain domain of research can be reached, it has to be shown *how* it can be done. The other approach suggests that methodological reflection comes *after* some work over concrete problems has already been done – a scholar may come back to the results of their discipline and *post factum* ask the question about the way which led them to obtaining their answers[19]. Without going into details and not trying to estimate which of the two approaches is better, here it is applied the former. This means that – bearing in mind the great work done in *Science-and-Theology* by many – neither a particular author writing in the field, nor any established concepts will be analyzed here. Instead, consideration will be given to some results of the above-mentioned ITR theory in search of some ideas offered within it, that may be helpful in establishing the methodology of the area in question[20].

Broadly speaking, the aims of *Science-and-Theology*, as an interdisciplinary, scholarly discipline, may be divided into two groups: ge-

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[18] E.g. L.W. Fagg, *The Role of the Electromagnetic Interaction in Defining the Immanence of God*, in: Studies in Science and Theology, vol. 5(1997): *The Interplay Between Scientific and Theological Worldviews*, part I, ed. N. H. Gregersen, U. Görman, Ch. Wassermann, Labor et Fides, Geneva 1999, 20–32.

[19] M. Heller argues that insisting on formulating proper methodology, before any 'real' issues have been taken into consideration, may prevent the development of a given discipline, forcing its exponents to get stuck in insipid arguments instead of dealing with problems that matter. On the contrary – it may be shown that in many cases in the history of science, methodological awareness grew together with (or, indeed, after) 'practical' work undertaken by interested scholars. Cf. M. Heller, *Filozofia i Wszechświat*, Universitas, Kraków 2013, 3–4.

[20] The suggestion to search for the possibilities of the application of the results of the ITR theory to the science-theology debate, and some other ideas of this section, come from Z. Hajduk, *Z ogólnej teorii związków inter- oraz intrateoretycznych*, in: *Filozofia a nauka w myśli Księdza Kazimierza Kłósaka*, ed. Z. Liana, A. Michalik, Kraków – Tarnów 2004, 131–157.

neral and particular. The general goal is to describe properly the relations between theology and science, both of them taken as important components of human culture. Particular aims, in turn, may be seen as attempts to compare two (or more) theories as they are formulated in science on the one hand, and in theology – on the other, which means again finding a proper tool for the description of the relations between them. Here, however, we need to go further: not only to describe possible relations, but – if applicable – to find out what, if anything, given theories have in common, how they both contribute to something that lies beyond their respective, strictly defined and proper realms – to our desired general knowledge of the world, to the worldview.

### 4.1. SCIENCE-AND-THEOLOGY: GENERAL GOAL

As for the main goal of *Science-and-Theology*, this task was undertaken by many, yielding interesting typologies of the relation in question, including – perhaps the best known – the one proposed by I. Barbour who speaks of 'conflict', 'independence', 'dialogue' and 'integration'[21]. Although, intuitively, such typologies offer a good tool for the description of the history of the relations between science and theology, and may be used in contemporary discussions about mutual influence of the two disciplines on each other in the context of human culture, it is important to note that they use analogous notions, which basic meanings, possible to be strictly defined and univocally understood, refer to human relations. For instance it is not quite clear how two theories can be involved in mutual 'dialogue' or how they can be in 'separation' from one another. In other worlds, those typologies suffer from a weakness common to any constructs based on analogies – it is difficult to estimate their accuracy.

Can ITR theory be of help in the context of the general aim of *Science-and-Theology*? The ITR originated – and is being developed – in the

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[21] I.G. Barbour, *Religion and Science. Historical and contemporary issues*, HarperCollins, San Francisco 1997, 77–105. See also: M. Stenmark, *Models of Science and Religion: Is there any Alternative to Ian Barbour's Typology?*, in: Studies in Science and Theology 10(2005–2006): *Streams of Wisdom? Science, Theology and Cultural Dynamics*, ed. H. Meisinger, W.B. Drees, Z. Liana, Lund University, Lund 2005, 105–119.

philosophy of science. Its original goal was to find a basis for the unification of natural sciences, and also to make the idea of the progress in science more clear. One of the ways to prove the unity of various disciplines is to show that theories formulated in one of them can be reduced to those of another. Furthermore, to see that we can speak of progress in science, one has to be able to say that a theory, which succeeds another one, is (in any possible sense) better than its predecessor. To do so, one has to find a tool to compare two theories belonging either to two various disciplines or to the same one. Therefore, the basic 'items' that ITR considered were *theories*, or their components such as terms or hypotheses. From this point of view, the ITR theory does not seem promising for the general aim of *science-and-theology*, since here we want to compare not single theories, but those disciplines as a whole or even worldviews which they offer.

### 4.2. SCIENCE-AND-THEOLOGY: PARTICULAR AIMS

Although in the contemporary philosophy of science, methodological 'units', the relations between which are considered as possible to be described in the ITR, are broader than just theories, the tools which the ITR developed, due to its history, are well adapted to the comparison of theories, and in the context of particular theories they seem to be possible to apply in a 'safe' way. It may be worthwhile to see therefore, if those tools may be useful when in comes to the comparison of a scientific theory with a theological[22] one, that is – in trying to reach some particular aims of *Science-and-Theology*, as they were described above.

Against the idea of using the tools of the ITR theory in *Science-and-Theology*, an obvious objection may be raised. The ITR helps to compare theories in natural sciences, which have to be empirically verifiable (or fallible, using Popperian terms). For clear reasons, theological theories cannot have that feature, what raises the question if

[22] It is assumed here that the notion of a *theory* can be used with regard to theological ideas, although the meaning of this notion in the context of theology, especially in comparison with its meaning in science, should be carefully considered. Such considerations are not undertaken in this paper.

the ITR, developed in the context of empirical theories, can be of any use in the description of non-empirical ones. Somehow paradoxically, another result of the philosophy of science comes of help here. It is Duhem-Quine thesis of the underdetermination of scientific theories by empirical data. In its most radical form it says that any theory can be saved in the light of any empirical evidence – a set of its assumptions, auxiliary hypotheses, etc. can be modified in such a way that any experimental outcome can be shown to be in accordance with it[23]. Even if this form of the underdetermination thesis can be rejected (which is not entirely obvious) by some arguments taken from the history of science, certainly, empirical evidence alone is not sufficient when it comes to comparing two competing theories. As it was shown beyond reasonable doubt in the fall of the orthodox positivism, there is not such a thing like purely empirical statements. If so, the ITR has to search for other, non-empirical criteria, what preliminarily opens up a possibility to apply this theory beyond empirical context, for example with regard to theological theories.

The thesis of underdetermination, in its other – let's call it 'ontological' – form, may encourage us further to look deeper into the ITR. It says that for every scientific theory, a counterpart can be found, which will have exactly the same empirical consequences (a set of statements that can be inferred from a theory and checked against the outcome of possible experiments), but will differ in the so-called 'postulated ontology'. The notion of 'postulated ontology' is certainly not clear and the task of defining it precisely enough should be undertaken. Preliminarily however, we may understand it as a set of statements concerning what exists and what does not, and what are fundamental features of what exists. What follows from the 'ontological' form of the underdetermination thesis therefore, is that our basic knowledge about the world is 'empirically independent'; that is: empirical evidence cannot serve as a theory-choice criterion, where 'theory' means ontology of

[23] This is not just a temporary feature of a theory, but a general 'rule': "(…) science is empirically under-determined; under-determined not just by past observation but by all observable events". W.V. Quine, *On empirically equivalent systems of the world*, Erkenntnis 9(1975)3, 313.

the (material) world[24]. In this way, the thesis in question shows that although certain ontology may be suggested by scientific theories, it cannot be 'forced' by them. This implies that one may search for such ontology, which would be in accordance with scientific data, but which also would have another sources, among them – theology. Incidentally, it is worth to note that the underdetermination thesis disarms those opponents of the 'dialogue' between science and theology who maintain that science always have to win, because it appeals to the final and decisive instance of empirical verifiability.

The ITR theory seems to be not only possible to apply in *Science-and-Theology*, but such an application may also prove fruitful. The ITR tools may be used firstly to *describe* more accurately the relations between particular theories in theology and science. One of the most interesting categories, from this point of view, is that of incommensurability. The idea comes originally from Th. Kuhn's considerations over the problem of change in science. Two subsequent theories may be incommensurable, when, with the change from one to another, the meanings of their theoretical terms also change. This change in meaning may be so fundamental that any translation from the language of one theory into the language of the other is impossible. Applying this category in the *Science-and-Theology* field, it is hard to deny that theories in theology and science are incommensurable[25]. However, as it was shown in the ITR, incommensurability does not imply that the two theories are incomparable. For instance, if it may be proved that a preceding theory anticipated some features of its successor, and

[24] Cf. W.V.O. Quine, *Pursuit of truth*, Harvard University Press, Cambridge 1990, 56; Idem, *Theories and things*, Harvard University Press, Cambridge 1981, 21.

[25] Maybe not necessarily and not all of them. The problem of incommensurability would have to be considered with regard to a given pair of scientific and theological theories. In particular, a generalised view that incommensurability as such excludes any possibility of relating science and theology is an oversimplification, especially when this thesis is not critically distinguished from such views as "Wittgenstein's philosophy of 'language games', [or] Steven J. Gould's 'non-overlapping magisteria'". L. Oviedo, *From the Editor: Science-and-theology,* lost in translation*?*, ESSSAT News & Reviews 23(2013)3, 3.

– what follows – those features were 'saved' in the latter[26], although these theories may be incommensurable, they certainly can be somehow compared, at least in its elements. For the *Science-and-Theology* discipline it means, that although the languages of two given theories may be impossible to translate into one another, those theories can still be compared.

The ITR offers many more categories useful for the description of the relation between two theories in science and theology, incommensurability being one of the most interesting examples. Among others there are (in)concordance, (in)consistency, competition. They seem to be able to serve as good tools in the field of *Science-and-Theology*[27].

The category of incommensurability has been pointed out above as an example of a useful tool to *describe* the relation between two given theories. But it can also bring us to our further task: to find out how such two theories can contribute both to our general *knowledge*. Two theories are incommensurable (weaker form of this category), when – dealing with the same realm, 'part' of reality, they suggest different non-empirical features of that reality. In other words: the differences occur in their respective 'postulated ontologies'. Here we have the same idea, which lies behind the 'ontological' form of the thesis of underdetermination mentioned before: theories can differ in their ontological layer, and yet belong to human knowledge as equally rational components of it.

An interesting problem is whether the 'postulated ontology' of a given theory is implied entirely by this theory, is somehow 'included' in it, or – in order to uncover this ontology – we have to have preliminary philosophical assumptions[28]. It would seem that theories – scientific and theological – do not contain any independent ontology. Some ar-

[26] The idea of the anticipation of a theory $T_2$ by its predecessor $T_1$, and the notion of 'saved features' are discussed in the ITR.

[27] Cf. Z. Hajduk, op. cit.

[28] Among such assumptions, a particular choice in epistemology of science – that of "critical realism" – can bring interesting "opportunities as a bridge between natural sciences and religion or theology". M. Karaba, art. cyt., 173.

guments in favour of this view could be derived from yet another set of ideas present in the contemporary philosophy of science. Certain antirealist approaches to the problem of the epistemological status of scientific theories suggest that these theories do not offer any 'true' view of the world. Anyway, without trying to solve this problem, one of the main tasks of *Science-and-Theology* may be suggested as follows: to try to *find* consistent ontology, hidden behind various – theological and scientific theories, or to *build* it with the help of theological and scientific data, using previously construed philosophy, which could serve as a proper basis for this attempt. The ITR theory seems to offer hope that such an attempt may prove successful, and tools, which make this hope justified.

## 5. CONCLUSION

Human desire for understanding has been the driving force behind our cognitive efforts since the dawn of thought. People want to *know* for the sake of knowledge, and not just be sufficiently equipped to deal successfully with everyday needs. The considerations offered in this paper suggest that science is incapable of fulfilling this desire by itself. While providing invaluable insights into the workings of nature, its characteristic features make it much closer to the ideal of 'to know in order to use' than to that of 'to know in order to know'. A *worldview*, worthy of its name, has to be open, therefore, to other sources of cognition. Those who allow religion among such supplementary sources of knowledge have to find proper methods of relating the two in such a way that could produce a consistent account of the world. Certain concepts present in the *Inter-Theoretic Relations* theory, such as underdetermination and incommensurability, though developed out of the context of *Science-and-Theology*, suggest that religion and science have to neither engage in an irresolvable conflict, nor remain in a 'splendid isolation', but can be reconciled into the desired worldview.

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