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THEOLOGICAL AND SCIENTIFIC METAPHORS. A PHILOSOPHICAL CRITIQUE: THE DIFFICULTIES OF A DIALOGUE BASED ON METAPHORS

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ABSTRACT. The specific languages referred to in this presentation are: philosophical language, scientific language, theological language and mathematical language. The specific metaphors referred to in this presentation are: metaphors of physics, metaphors of theology and metaphors of mathematics. Both theological and scientific languages have metaphorical components but, the activity of interpretation of metaphors *in* science and *in* theology does not have an interdisciplinary character. Of course, we cannot speak about dialogue without communication between various fields, without passing from one specialized language to another specialized language. In the extremely delicate but possible dialogue between science and theology, first must be seen the "strong differences" between which can hardly be built bridges for dialogue. Not least, and perhaps equally important, must also be seen the "quicksand" of the languages, as metaphors are, over which building bridges for dialogue can lead to communication but it can lead as well to misunderstanding and confusion. The question raised in this paper is: Is it possible to be initiated a dialogue between science and theology starting from metaphors of these languages? The present paper proposes to suggest this aspect.

Keywords: *scientific metaphors; theological metaphors; scientific description; theological description; scientific interpretation; theological interpretation; theological epistemology; trans-disciplinary dialogue*

Bridge of Metaphor

The metaphor is a procedure by which one can pass from the usual meaning of a word (concept/expression) to a different (new) meaning that the word cannot have unless *by virtue of an analogy*, but without a total unification of meaning. The transfer may lead to original artistic, scientific, theological, etc. images, and often imply terms distinct in meaning or even placed in a certain degree of opposition. The *image*-"word" replaces the *object*-"word" of a comparison.

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Analogy. The Basis of Metaphor

Next, a general, philosophical-analytical characterization of analogy will follow, with regard to the subject of the article. It is usually accepted, with no further theoretical considerations and no special care for logical rigour, that when we compare and find similarities we are sometimes tempted to create analogies. We see similarities and we are challenged to push these similarities beyond what is "seen". Such an attitude is also maintained by the relevance of results in certain cases, with regard to facts, methods, conceptual clarifications, etc. Analogy as a source of inspiration and artistic creation is not discussed here.

The present analysis begins with the general description of *analogy* oriented to the philosophical analysis of the relevance of the *metaphorical figurative language* in the theological and scientific conceptual clarification and the linguistic construction of certain theological and scientific images. Reasoning through analogy as reasoning is treated philosophically as a "form of analytic judgment", reducing the synthetic or ontological risk of conclusions reached through analogy. Thus analogy is just a potentiality of expression and clarification.

The meaning of the notion of *analogy* is relational: it denotes a relation of resemblance by correspondence. Resemblance means the emphasis of certain partial similarities. The level of correspondence is structural and it usually expresses an identical relation between elements of different entities. More accurately, resemblances and correspondences can be of form (structural) or content (substantial). For Wittgenstein, for instance, the possibility of analogy based on comparison is on the level of the logic of representation.

> "The possibility of all similes, of all the imagery of our language, rests on the logic of representation."[1]

The analogy between the waves of water and the waves of air (sound) is a suggestive scientific example of substantial analogy (water and air are both fluid environments, waves are in both cases pressure waves). The analogy can also be *formal* in relation to light waves. For a clear understanding of the content and limits of *formal analogy*, I chose an example from the course on Modern Physics of Professor R. P. Feynman, § 8.6, The Ammonia Molecule, from the volume on quantum mechanics. What is of interest here is the solving of this problem by analogy. The author refers to the problem of the mechanical behaviour of two identical pendulums, and makes the following observation on the quantum problem as such:

[1] Ludwig Wittgenstein, *Tractatus Logico-Philosophicus*, P 4015. - Project Gutenberg's *Tractatus Logico-Philosophicus*, by Ludwig Wittgenstein, October 22, 2010 [EBook #5740]

> "[…] we have […] an example of practical physics problem that you can solve with the help of quantum mechanics. [...]"
> "A long time ago we saw what happens when we have two equal pendulums with a slight coupling. (See Chapter 49, Vol. I.) […] Well, here we have a similar situation - the ammonia molecule is mathematically like the pair of pendulums. The pendulum analogy is not much deeper than the principle that the same equations have the same solutions."[2]

The following elements seem important in the illustration of this analogy: "*... here we have a similar situation ... The* [pendulum] *analogy is not much deeper than the principle that the same equations have the same solutions*" with the specification: "*the same equations have the same solutions*." This clearly suggests in what way a scientific (physical) analogy is formal.

On the one hand, analogies can also occur between entities of the same nature: different animal organisms, different people, various physical phenomena, alternative formal systems, etc. On the other hand, analogies can occur between elements of completely different nature: in a certain sense, for instance, "man" / "car", on in a more distant sense, for instance, "attributes of a God" (transcendent)/ "attributes of the real world" (immanent), or "the image of God" / "the image of man" (on the image and likeness of God), "the Kingdom of God" / "the World of man" (analogy expressed by Jesus, as will be seen, by a plurality of particular analogies), etc.

Analogies are formulated by the explicit or implicit assumption of presuppositions which seem to justify certain resemblances and correspondences. The legitimacy of analogies is basically the main point of discussion. In the context of a general presentation of the analogy, we formulate a necessary condition for the legitimacy of scientific analogies on the level of language: the logical and mathematical correctness of discursive, argumentative, illustrative and clarifying approaches. This necessary condition is by far not a sufficient condition as well. However, it is not a necessary condition for theological analogy.

A Very Brief Overview of what is "Theological Epistemology"[3]

The epistemology of theology as theological epistemology means a critical analysis of appropriate epistemic objectives as applied to theology, and can be interpreted as the *theory of theological knowledge*. It could explore some special

[2] http://www.feynmanlectures.caltech.edu/ (Volume III. *Quantum Physics* § 8–6 The ammonia molecule)

[3] "With its specific character as a discipline charged with giving an account of faith, the concern of *fundamental theology* will be to justify and expound the relationship between faith and philosophical thought." - John Paul II, Encyclical Letter *Fides et Ratio* (1998), 67

problems like: metaphor and analogy; metaphors for God (in particular metaphors in science and in theology); reasons for speaking hypothetically; image schema; literal and metaphoric truth etc. Theology generally means the discourse of God. In this context of theology and analytical epistemology the general subject of the paper is philosophical analysis - from the perspective of analytical philosophy - of one issue of theological epistemology. In this sense the objective of the paper is a comparative presentation of one epistemological problem from the points of view of science and theology: the difficulties of a dialogue based on metaphors, theological and scientific metaphors.

For the scientific part, direct reference is made to physics, by examples from quantum mechanics whose scientific and epistemological interpretation is plausible and relevant for the discussion. In the same way, for the theological part, direct reference is made to the Bible, by examples from the New Testament whose theological and epistemological interpretation is plausible and relevant for the discussion.

The Metaphor in an Analytical Perspective

A metaphor is a figure of speech, in order to *suggest* a resemblance that identifies something as being the same as some unrelated thing for highlighting similarities between the two. Metaphors are "image schemas", they are dynamic stories / images embodied patterns of interactions that emerge as meaningful for us through our perceptions related to these interactions. In general these "image schemas" are not abstract images, they are primarily intuitive images. Habitually metaphors have details of concrete images.

The problem of metaphor is treated in analytical philosophy and cognitive linguistics in terms of linguistic structures, image schemas, metaphor and analogy, metaphoric process, metaphorical mapping etc. From this perspective, without a conceptual framework, it is very difficult to gain a view of scientific or theological reality independent from metaphorical and figurative conceptualizations. It is known that there are such metaphorical and figurative conceptualizations in empirical sciences and formal sciences [mathematics]. It is also important to emphasize the limits of metaphors in science. The same approach can be found in what is called the Cognitive Science of Religion. The field of research that has come to be known as "the cognitive science of religion" emerged as an interdisciplinary field seeking to advance a more scientific approach to the study of religion.

Recognizing the role of metaphors does not in itself prove or demonstrate the validity of any particular scientific or theological notions or "realities". The metaphor does not establish the credibility of any specific scientific or theological conception or

theory. The *metaphor* is not a scientific or theological argument, it is not a scientific or theological explanation, it is not a "scientific image" or a "theological image" but it could be an important step for accomplishing these tasks, for a scientific or theological *understanding*. A metaphor can *clarify*. In cases when the pretence of metaphorical language to represent a certain type of knowledge seems illegitimate, there must be at least a critical-philosophical test conducted on linguistic level. Conceptual, philosophical and theological clarifications also attempt to identify the strict frontiers of metaphors where the infringement of these frontiers may lead to confusion and misunderstanding.

A basic premise, formulated as a necessary condition of metaphorical language, is as follows: "Natural language is a *necessary condition* of any form of metaphorical language."[4] In this sense the statement "If a metaphor is expressed in a specific language - scientific, theological or philosophical - then it also has a reference with a form of expression in natural language within certain limits". Under the same terms of necessary condition we shall accept the following presuppositions: "If a metaphor is scientific, then directly or indirectly, one way or another, it speaks necessarily about nature, about the world of scientific facts.", and "If a metaphor is religious, then directly or indirectly, one way or another, it speaks necessarily about God, about the kingdom of Heaven". From this perspective the necessary condition for a scientific metaphorical language is its reference only to nature, a nature without the presence of God. The necessary condition for a theological metaphorical language is, explicitly or implicitly, the presence of God in this world or out of this world. But philosophically and theologically speaking, what represents a major risk is the analogy between scientific and theological metaphors. Any field that aims to use metaphors, in its particular way, has its own specific metaphorical language. Although these considerations seem evident, they never become compelling and as a result one can easily get to illegitimate mixtures of fields: conceptual confusions, inadequate application of criteria and methods from one field to another, etc.

Analogy - analytical schematization

Some analogies are an elementary example for inductive reasoning. These are based on a comparison between entities E_1 and E_2, starting from supposed resemblances between these. Provided that the correspondences between properties of both E_1 and E_2 have been established, and one property of, say, E_1 has been identified which does not

[4] For the sake of clarity, I present a suggestive illustration of the logic used for a necessary condition: "If a number can be divided by four, then it can be divided by two." This way the divisibility by two appears as a necessary condition for the divisibility by four.

apply to E_2, the analogy extrapolates the possibility of this property's applying to E_2 as well. In this sense the analogy is a logical procedure of derivation of certain conclusions on the basis of certain premises; it is a *probable* inference starting from certain resemblances accepted as unproblematic and reaching to other resemblances recognized as possibly problematic.

Simplifying the formal structure of the analogy, it can be represented as follows: the two entities E_1 and E_2 are similar and *allow correspondences*. In order to avoid the risk of identifying E_1 with E_2, we shall simply presuppose, for instance, that E_1 has a property p_k which, in relation to the assembly of presupposed correspondences, is not found in E_2. For example, in an analogy of man-car, it is presupposed that the car has no life, it is not live.

Entity E_1 has the properties: p_1, p_2, ..., p_n.
Entity E_2 also has properties: p_1, p_2, ..., p_n.

We find that entity E_1 also possesses property p_{n+1} which satisfies correspondence criteria for p_1, p_2, ..., p_n, and is not excluded from pertaining to E_2. On the basis of these premises, through an inductive reasoning, appears that property p_{n+1} possibly pertains to entity E_2. The drastic reduction of the analogy to this structure allows for grasping the limits and guides to the analysis of conditions of legitimacy of certain possible particular analogies. While the formal structure presented above allows the clarification of its conditions of legitimacy, the next concrete (classic) example illustrates the risks of drawing hasty conclusions through an apparent analogy.

The universe is like a watch.
A watch is always made by a watchmaker, by a creator.
Consequently, the Universe has a Creator.

The analysis of the analogy as presented above sends to two observations sketched here. In the presented example, the "watch" has a *necessary* property for its existence, but exterior to its nature: the presence of a creator-watchmaker. This property is attributed by the analogical extension of the universe. However, the analogy can be reformulated for instance in relation to the internal mechanical structure of the watch in a philosophical interpretation.

The universe is like a watch.
A watch has a mechanism which conditions its behaviour, and has a strictly deterministic dynamic.
Consequently the Universe is strictly deterministic in its evolution.

The analysis of the analogy in this last formulation refers to a *necessary* internal property, inherent to its nature: the presence of a structure that conditions a strictly deterministic behaviour (one may hardly find any more deterministic machinery than a watch (!)). This property is attributed to the universe through analogical extension.

The example is suggestive, among other things, also to describe what is "the rejection through logical analogy": a method which shows that a certain analogy can be wrongly interpreted, constructing another analogy of the same form but whose interpretation is obviously inacceptable. From a logical-philosophical point of view, with the *premise* of placing man into this World, the following example is a "rejection through logical analogy":

> *Man was created in the image and likeness of God.*
> *"God said, 'Let us make man in our own image, in the likeness of ourselves […]."*[5]
> *God is immortal.*
> *Consequently man is immortal.*

The formal languages of logic and mathematics are necessary conditions for scientific languages. But, the formal language of logic is not a necessary condition for the language of theology. Thus the analogy mentioned above can be transferred to a theological register, while immortality, (re)*interpreted* within this register, may refer to the soul of man, the immortal soul, or the immortality of man in another world, the Kingdom of God. This last example together with the observations that accompany it, draw attention over some other important philosophical aspects regarding analogies in particular and metaphors in general: the philosophical problem of the premises tacitly underlying the analogies.

The formal analysis of the analogy is based on comparisons and similarities. The *comparison* that the analogy is based on does not go beyond the simple finding or recording of certain similarities and correspondences, as well as certain differences. The *similarity* on which the analogy is based represents the emphasis put in comparison on resemblance. In a logical-analytical language the following linguistic "dynamics" can be expressed: the comparison is a necessary condition of similarity; similarities make up a necessary condition for analogy; the analogy is a necessary condition for metaphor.

In this succession, depending on the premises, there will be similarities established within the comparison; by *interpretation*, similarities pass to analogy; finally, through the metaphor a reconfiguration of meaning is achieved at various levels of interest. The most familiar meanings of metaphors are the artistic senses, those which, through metaphorical transfers, lead to new artistic images in the sphere of experiences.

[5] Genesis 1, 26.

A sense close to this artistic one is that of theological metaphors, noting that in this case there is also a sense of theological understanding involved, not merely that of the strengthening of theological experience. In science, the metaphor seeks first of all conceptual clarification, phenomenological-scientific understanding. It is a scientific proposal at the level of new images, but merely epistemological in content.

It is recognized that analogies sometimes have a heuristic role, as a starting point in a scientific, theological, philosophical research, gradually diminishing towards the final point of the research. What it such a recognition based on?

(i) First, on the interpretation of the *comparison* (the results of the comparison).

According to the dictionary definition, comparison means: "The examination of one or several things, beings or phenomena, with the purpose of establishing similarities and differences between them."[6] (A consideration or estimate of the similarities or dissimilarities between two things or people.[7]) The comparison mainly has a descriptive role.

The *comparison* is interpreted as a premise and support of analogy in the following relative situation:

- for two entities E_1 and E_2, the properties $P_{i\ (\text{of resemblance})}$ by which these resemble each other are more numerous than properties $P_{k\ (\text{of difference})}$.
- $P_{i\ (\text{of resemblance})}$ are interpreted as being more important than $P_{k\ (\text{of difference})}$; at least in a certain context, from the perspective of interests followed through analogy

(ii) Secondly, the legitimacy of the *inductive reasoning* in supporting the conclusion of the analogy is also the result of interpretation:

- for the content of the conclusion properties $P_{i\ (\text{of resemblance})}$ are assessed as significant and relevant, while properties $P_{k\ (\text{of difference})}$ are assessed as insignificant and irrelevant.
- there is a presupposition that properties $P_{i\ (\text{of resemblance})}$ belong to the nature of entities, on the level of "necessity", while properties $P_{k\ (\text{of difference})}$ are circumstantial in nature, on the level of the "accidental"
- the new property P_{n+1} for E_2 is strongly connected with the properties $P_{i\ (\text{of resemblance})}$.
- the conclusion of the analogy expresses a relatively modest cognitive content

(iii) Thirdly, the quantitative aspect regarding the number of different entities that can be compared by unitary criteria also has a certain amount of value.

[6] Explanatory Dictionary of the Romanian Language, Editura Univers Enciclopedic, 1998.
[7] http://www.oxforddictionaries.com/definition/english/comparison

Observing these requirements determines increased trust in the conclusions of reasoning through analogy while violating one of more of these requirements weakens the argumentative force of analogy.

A Very Brief Overview of What is "Theological Epistemology"[8]

The epistemology of theology as theological epistemology means a critical analysis of appropriate epistemic objectives as applied to theology, and can be interpreted as the *theory of theological knowledge*. It could explore some special problems like: metaphor and analogy; metaphors for God (in particular metaphors in science and in theology); reasons for speaking hypothetically; image schema; literal and metaphoric truth etc. Theology generally means the discourse of God. In this context of theology and analytical epistemology the general subject of the paper is philosophical analysis - from the perspective of analytical philosophy - of one issue of theological epistemology. In this sense the objective of the paper is a comparative presentation of one epistemological problem from the points of view of science and theology: the difficulties of a dialogue based on metaphors, theological and scientific metaphors. For the scientific part, direct reference is made to physics, by examples from quantum mechanics whose scientific and epistemological interpretation is plausible and relevant for the discussion. In the same way, for the theological part, direct reference is made to the Bible, by examples from the New Testament whose theological and epistemological interpretation is plausible and relevant for the discussion.

Transdisciplinary Analogies. Sources of Some Theological Metaphors[9]

Here are some directions of possible metaphorical constructions of theological (religious) importance:

• metaphors from philosophical language to theological (religious) language, important for certain conceptual clarifications in theology[10];

[8] "With its specific character as a discipline charged with giving an account of faith, the concern of *fundamental theology* will be to justify and expound the relationship between faith and philosophical thought." - John Paul II, Encyclical Letter *Fides et Ratio* (1998), 67

[9] See Robert Masson - *Without Metaphor, No Saving God -Theology After Cognitive Linguistic*, PEETERS, Leuven-Paris-Walpole, MA 2014

[10] *Fides et Ratio*: "It is not just a question of theological discourse using this or that concept or element of a philosophical construct; what matters most is that the believer's reason use its powers of reflection in the search for truth which moves from the word of God towards a better understanding of it.", 73.

• metaphors from scientific-empirical language to theological (religious) language, relevant for the existential theological sense / meaning of facts;

• metaphors from mathematical-formal language to theological (religious) language, relevant for the onto-theological meaning / sense of symbols.

We illustrate the latter case with an example. There is the possibility of exploiting some suggestive analogies of language between theology and mathematics by interpretation of purely mathematical results. In this way mathematics can be a point of reference on language level, a source of metaphors in theological expression. This short example refers to the case of letter exchange between German mathematician Georg Cantor and the top community of Catholic theologians in the second half of the 19th century.[11] As a mathematician, in his dialogue with the community of mathematicians on the subject of infinity, Cantor never made reference to God. However, in his private correspondence Cantor made explicit references to God. [12]

The first observation is that mathematical language can be correlated at a metaphorical level with our world of facts, by finite sets. The second observation is that the same kind of mathematical language can be correlated at a metaphorical level with a "transcendent world", by infinite sets. By analogies and metaphors, mathematical language is correlated with theological content and relations: God and our finite world, God and His infinite world, God and his attributes etc.

Metaphors are created on the basis of mathematical formulations with theological significance. The language of mathematical signs understood as symbols with theological significance may imply theological content and representations that these symbols make possible without infringing internal religious requirements. (The opposite is also true: this is done without the violation of correctness of mathematical language.) Such metaphors project mathematical forms of language (finite sets, infinite sets etc.) in theological language. The resulting "images" are images of theology. In this way mathematics can "project" its own forms in a certain kind of metaphors, whether of science, theology, or art.

The metaphors from mathematics toward theology are images/interpretations of mathematical language in theological language and they show a certain kind of *theological images* of "facts", "relationships" etc. which are not from this *world*. Let

[11] "He was also keenly aware of the ways in which his work might in turn aid and improve both philosophy and theology. Prompted by a strong belief in the role set theory could play in helping the Roman Catholic Church to avoid misinterpreting the nature of infinity, he undertook an extensive correspondence with Catholic theologians, and even addressed one letter and a number of his pamphlets directly to Pope Leo XIII." - Dauben, 85

[12] By the early part of 1884, he could write to Mittag-Leffler that he was not the creator of his new work, but merely a reporter. *God* had provided the inspiration, leaving Cantor responsible only for the way in which his articles were written, for their style and organization, but not for their content. – Dauben, 105-106 (Cantor to Mittag-Leffler, Jan. 31, 1884, in Schoenflies (1927), 15-16.)

us mention however that both religious and mathematical language are autonomous on their content level and neuter in their mutual relationship. In strict connection with the example chosen, it must be emphasized all over again that the mathematical metaphorical language or the mathematical language in general or mathematics in general brings no arguments either for the existence of God, or for the faith in God or the legitimacy of theological metaphors. Mathematics does not prove anything from a theological point of view. These metaphors can have a *theological meaning* or even a *theological sense* may *show* something theological, even if it does not "share" a mathematical form with God's world that it speaks about but only projects a mathematical form over this theological world.

The Autonomy of Metaphors in Theology and Science

For metaphor in scientific language the problem is given by the relationship between the "metaphorical images" and facts (scientific facts). In this context it is the same problem for theology: for metaphor in theological language the problem is given by the relationship between the "metaphorical images" and God's world (a transcendent world).

We consider metaphors the following biblical examples:[13]

• [24] He put another parable before them, *The kingdom of Heaven may be compared to a man who sowed good seed in his field*. (Mathew 13)

• [31] He put another parable before them, *The kingdom of Heaven is like a mustard seed which a man took and sowed in his field*. (Mathew 13)

• [33] He told them another parable, *The kingdom of Heaven is like the yeast a woman took and mixed in with three measures of flour till it was leavened all through*. (Mathew 13)

• [44] *The kingdom of Heaven is like treasure hidden in a field which someone has found; he hides it again, goes off in his joy, sells everything he owns and buys the field*. (Mathew 13)

• [45] *Again, the kingdom of Heaven is like a merchant looking for fine pearls*; [46] *when he finds one of great value he goes and sells everything he owns and buys it*. (Mathew 13)

• [47] *Again, the kingdom of Heaven is like a dragnet that is cast in the sea and brings in a haul of all kinds of fish*. [48] *When it is full, the fishermen bring it ashore; then, sitting down, they collect the good ones in baskets and throw away those that are no use*. (Mathew 13)

[13] Examples were chosen only from the Gospel According to Mathew.

• [23] *And so the kingdom of Heaven may be compared to a king who decided to settle his accounts with his servants*. (Mathew 18)

• [1] *Now the kingdom of Heaven is like a landowner going out at daybreak to hire workers for his vineyard*. (Mathew 20)

• [1] Jesus began to speak to them in parables once again, [2] *The kingdom of Heaven may be compared to a king who gave a feast for his son's wedding*. (Mathew 22)

• [1] *Then the kingdom of Heaven will be like this: Ten wedding attendants took their lamps and went to meet the bridegroom*. (Mathew 25)

The Parable of the Tares. The Theological Metaphor ("Metaphorical Image")

The *theological metaphors* are real or fictitious stories that can be seen as the commonplace experiences of many people, stories which point up and illustrate spiritual truths.

[24] He put another parable before them, "The kingdom of Heaven may be compared to a man who sowed good seed in his field. [25] While everybody was asleep his enemy came, sowed darnel all among the wheat, and made off. [26] When the new wheat sprouted and ripened, then the darnel appeared as well. [27] The owner's labourers went to him and said, "Sir, was it not good seed that you sowed in your field? If so, where does the darnel come from?" [28] He said to them, "Some enemy has done this." And the labourers said, "Do you want us to go and weed it out?" [29] But he said, "No, because when you weed out the darnel you might pull up the wheat with it. [30] Let them both grow till the harvest; and at harvest time I shall say to the reapers: First collect the darnel and tie it in bundles to be burnt, then gather the wheat into my barn."" (Mathew 13, 24-30)

Theological Description and Explanation ("Theological Image")

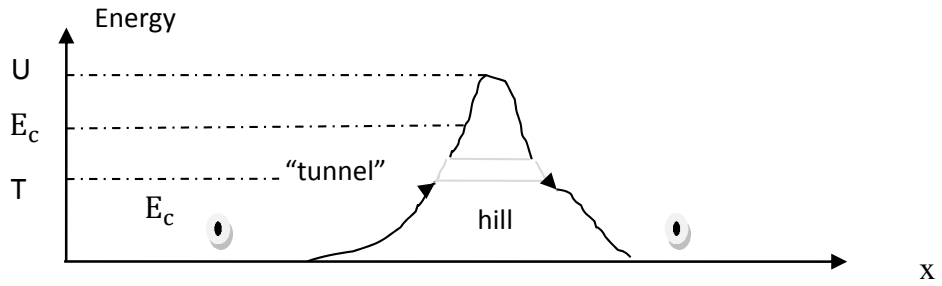
[36] Then, leaving the crowds, he went to the house; and his disciples came to him and said, "Explain to us the parable about the darnel in the field." [37] He said in reply, "The sower of the good seed is the Son of man. [38] The field is the world; the good seed is the subjects of the kingdom; the darnel, the subjects of the Evil One; [39] the enemy who sowed it, the devil; the harvest is the end of the world; the reapers are the angels. [40] Well then, just as the darnel is gathered up and burnt in the fire, so it will be at the end of time. [41] The Son of man will send his angels and they will gather out of his kingdom all causes of falling and all who do evil, [42] and throw them into the blazing furnace, where there will be weeping and grinding of teeth. [43] Then the

upright will shine like the sun in the kingdom of their Father. Anyone who has ears should listen! (Mathew 13, 36-43)[14] The kingdom of Heaven is of course different from our world. The metaphor helps us understand that world - the kingdom of Heaven - even if that world order and laws are different. This is done starting from the familiarity of our world (familiar order, familiar laws, familiar images etc.). In this theological context, metaphor requires interpretation. By an epistemological point of view, metaphor is not a description or explanation; metaphor is an *explication*, it is a form of clarification. (*Explanation* and *explication* are often confused, mixed, superposed etc.)

The Tunnel Effect. The Scientific Metaphor ("Metaphorical Image")

The scientific metaphors are real possible scientific "images" (texts or pictures) that can be seen as "clarification analogies" to illustrate and clarify certain scientific phenomena.

The *tunnel effect* refers to the quantum mechanical process where a particle tunnels through a barrier that it classically could not surmount; or *tunnel effect* is a process by which a particle can pass through a potential energy barrier that is higher than the energy of the particle (or quantum tunnelling is the quantum-mechanical effect of transitioning through a classically-forbidden energy state.)[15]



Consider rolling (classically) a ball up a hill. If the ball is not given enough velocity (or kinetic energy), then it will not roll *over* the hill. Classically, in this case the movement of a ball (particle/corpuscle) is very familiar, intuitive and simple. If

[14] Alternative theological interpretations. "The Parable of the Wheat and the Weeds, or Tares, is filled with spiritual significance and truth. But, in spite of the clear explanation of the parable that Jesus gave (Matthew 13: 36-43), this parable is very often misinterpreted. Many commentaries and sermons have attempted to use this story as an illustration of the condition of the church […] While this may be true, Jesus distinctly explains that the field is not the church; it is the world. […]" - http://www.gotquestions.org/parable-wheat-tares.html

[15] For instance *tunnel effect* explains the escape of alpha particles from atomic nuclei.

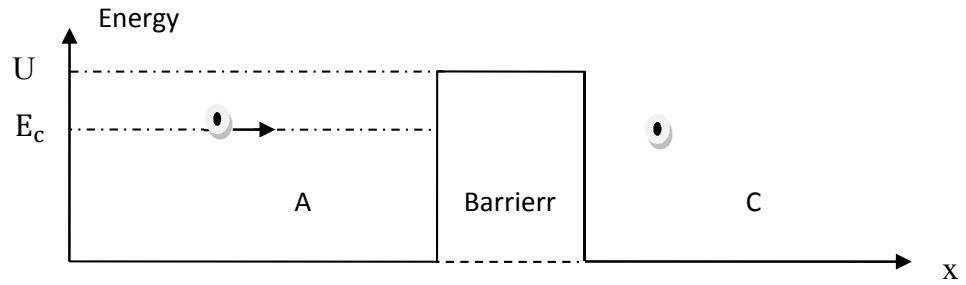
its energy is greater than the height of the barrier, it crosses it. If, on the other hand, its energy is lower than the height of the barrier, the particle can no longer cross it (and is reflected by it). But if the particle finds a tunnel through the hill: E_c then it can cross the hill. This makes a good sense classically (*in the* "*classical world*"). But in quantum mechanics (*in* "*another world*" *than the* "*classical one*"), objects do not behave like classical objects (such as balls) do.

[Paraphrasing] "The quantum world may be compared to /(is like) a ball which has not enough velocity (or kinetic energy) to roll over the hill but it finds on its way a tunnel through the hill and so it can cross the hill."

The quantum world is of course different from our world, the classical world. The metaphor helps understand the quantum world even if its order and laws are different. This is done starting from the familiarity of our world (familiar order, familiar laws, familiar images etc.). In this scientific context, metaphor requires interpretation. By an epistemological point of view, metaphor is not a scientific description or scientific explanation; metaphor is a form of *explication* (referring only to the world of physics (!)), it is a form of clarification. (There is often a risk for *explanation* and *explication* to be confused, mixed, superposed etc.)

Quantum (Scientific) Description and Explanation ("Scientific Image")[16]

Tunnel effect is explained by quantum wave mechanics. On a quantum scale, objects exhibit wavelike behaviour. For a quantum particle moving against a potential hill, the wave function describing the particle can extend to the other side of the hill. This wave represents the probability of finding the particle in a certain location, meaning that the particle has the possibility of being detected on the other side of the hill. This behaviour is called *tunnelling*; it is as if the particle has found a tunnel through the hill (potential hill).



[16] It is a very brief scientific presentation.

♦ particle with kinetic energy E_C (in region A) strikes barrier (region Barrier) with height E_C and width

♦ classically the particle cannot overcome the Barrier

♦ quantum mechanically the particle can penetrate the Barrier and appear on the other side (in region C)

♦ then it is said to have "tunnelled" through the Barrier

In this context a very simple *description* and *explanation* is:

"The transmission coefficient τ is the probability of a particle incident from the left region A to be tunneling through the barrier, region Barrier, and continue to travel to the right region C is $\tau = e^{-2\frac{\sqrt{2m(U-E_C)}}{\hbar}\Delta x}$ where m is the mass particle and $\hbar = \frac{h}{2\pi}$, $h - \text{Planck constant.}$[17]"

The quantum result is more unexpected: there still exists a non-zero probability of transmission, "across" the barrier (case: $0 < E_c < U$).

In a concise expression, this specifically quantum phenomenon appears, in general, under the name of the *tunnel effect* in the literature. This nomenclature is derived from the picture/image of a particle bumping into a "hill", of height U and unsurmountable to it, since it finds itself at an "altitude" $T \leq E_c < U$, and finding a tunnel into a "hill" or, more metaphorically, burrowing a tunnel through the "hill" to come out of the other side.[18]

Analytical Philosophical Remarks. "Metaphor" in Dialogue

In analytical philosophy, not infrequently, artificial problems are invented, constructed whose analysis leads to clarifications. In this way, for someone who is not familiar with physics, a possible interpretation in relation to the scientific metaphor of tunnel effect - starting from the "world of classical physics" to the "world of quantum mechanics" - could come next: "A (quantum) particle moving against a (potential) hill sometimes finds open, somehow, a tunnel in the hill. In this way the particle can cross the hill." This interpretation, however, has not, itself, anything to do with quantum mechanics scientific explanation; in the world of quantum mechanics the "objects" have another "nature" and another "behaviour" [the particles are not "balls", they do not "roll" etc.] and the form of the laws of

[17] For example an electron with kinetic energy $E_c = 1\text{eV}$ tunnels through a barrier with $U = 10\text{eV}$ and width $\Delta x = 0{,}5\text{nm}$ with a transmission probability $\tau \cong 1{,}1 \cdot 10^{-7}$ (this is a very small probability but it can be experimentally observed).

[18] Alternative proposal for metaphorical terminology.

physics is much different from classical physics. Strictly in this context we can make the following statements. In classical mechanics, in principle, the particle (ball) cannot do anything: it cannot cross the hill (potential hill) with any energy [unless in its "energy-interval" a tunnel is opened somewhere].

In quantum mechanics, in principle, the particle can do anything: it can cross the hill (potential hill) with any energy (no matter how small it is)! But with a certain probability; no matter how small it is (the probability) but it is not zero! Once again, the world of quantum mechanics is significantly different from "our world". (Observation. To develop analogies between "probability" and "tunnel" exceeds the scientific and philosophical legitimacy; it can possibly go toward an artistic metaphor.) It has made the following philosophical observation: the world of quantum mechanics is really our world, but on another scale; the kingdom of *Heaven* is not our world, it is a transcendent world.

The previous observations are readily accepted for scientific metaphor but the same thing doesn't happen with biblical/theological metaphors. For many people the lack of a theological culture, the lack of a theological interpretation exercise and last but not least the absence of any sensitivities of faith is not an impediment to build theological interpretations for theological metaphors. There is cautious about reporting to scientific metaphors but it doesn't happen with biblical/theological metaphors.

Both theological and scientific languages have metaphorical components. Is it possible that a dialogue be initiated between science and theology starting from metaphors of these languages? Apparently it seems to be a casual and friendly starting base for a dialogue. My opinion is different. Even sharing a preliminary mutual respect for domains, the interpretations of metaphors, within each area, are demanding and they are risky in the trans-disciplinary dialogue. They do not represent a starting point, but a dialogue which involves bilateral competences.

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