

BORDERLAND BETWEEN PHYSICS AND METAPHYSICS

Jerzy A. Janik

H. Niewodniczański Institute of Nuclear Physics PAN

ul. Radzikowskiego 152, 31-342 Kraków, Poland

e-mail: Jerzy.Janik@ifj.edu.pl

(Received 16 September 2005; accepted 25 October 2005)

Abstract

This paper starts from an information concerning a philosophical vocabulary (“Wortschatz”) as a sort of “laboratory” or “observatory” of scholars. Then the problem of physics and *esse* is discussed. It is declared that of the two aspects of being: *esse et essentia* – *esse* showed up in physics via the quantum mechanics. A connection between notions of physics and universals is suggested. The hylomorphic theory is discussed with stressing the role of the laws of physics. Finally the problem of Truth is discussed and a connection with what IS is being made.

1 “Wortschatz”

When studying papers written by philosophers I have an impression that they use a more or less colloquial language, although enriched by a scientific terminology. The amount of words (notions) (*Wortschatz* in German) was collected in course of centuries and millennia. This “Wortschatz” establishes sort of “observatory”, used by philosophers. This is clearly seen in writings of Thomas Aquinas, Martin Heidegger and Edith Stein. As a matter of fact, one should speak not about one language, but about languages. One may ask which language is the most suitable for operation in the field of philosophy. The classical Greek seems to be very suitable, but I can judge it only indirectly since I did not learn it at school. About Latin I can judge from my own observation. I think that it is a very good language for philosophical discussion. Its “Wortschatz” became richer because of the role played in medieval times. I also think that the German language is excellent in this sense, as nobilitated by the great German philosophy of the XVIII, XIX and XX centuries. Some years ago I informed the Pope John Paul II about this opinion. He said: “Polish is not worse”.

Philosophy has absorbed for its use such notions as: Being (*esse, das Sein*), being (*ens, das Seiende*), essence (*essentia, das Wesen*), power (*potentia, die Möglichkeit*), act (*actus, der Akt*), etc.

An important property of a language lies in its ability to apply an analogy in it. When we say: “Peter IS” and “God IS” we use the word IS not in the same sense, independent from the fact whether we believe in God or not.

Another property of a language lies in its adequacy to the region of our everyday experience only. When we leave this region we find some failure in expressing ourselves. For instance we say: “God HAS the truth”, and then we find ourselves in speaking in such a way that in God there is a composition of “properties” such as the truth, love etc. We may say “God IS the truth” but our “understanding” of God is not much better.

And how about the language of physics? One often claims that physics is using the mathematical language. I do not think, however, that a complete elimination of the colloquial language is possible. Of course this language must have an assistance of terminology. And also an assistance of analogy. For instance when we say: “Bullet

IS' and "Electron IS" we could think that we are informing about the location AND momentum of the bullet and the electron. Such expectance is justified only in the former case. For the electron it is senseless. But we are tempted to use in both cases the word IS. Thus we see an inadequacy of our language when we leave the macroscopic region.

More about "Wortschatz" will be said in next chapters.

2 Physics and *esse*

More detailed aspects of this chapter were published in a separate paper [1].

About what IS we declare that it IS and also what it IS. That presents the problem of being and essence, *esse et essentia*. This distinction was formulated by Thomas Aquinas, although it was suspected (not so clearly yet) in writings of his Arabic predecessors Averroes and Avicenna. Martin Heidegger is very much involved in the discussion on this distinction. Both (Thomas Aquinas and Heidegger) declare that what IS participates in sort of "Sea of IS" – in *esse* (Thomas) or in *dem Sein* (Heidegger) – *Ens habet esse, das Seiende hat das Sein*. Thomas identifies *Esse* with God, whereas Heidegger leaves this problem open.

For centuries physics was interested in essence of things (*essentia*). Finally the quantum mechanics formulated the question: what does it mean that something IS? And it answers: By using its equations we obtain (for an object) information concerning states and probabilities of their actualisations. Each such actualisation occurs as a result of the so-called reduction (collaps) of the wave packet. It leads to a flash of a defined state. Our object IS, although only in a flash. But next reductions of the wave packet provide next such flashes – for instance in form of next traces in the Wilson chamber (but belonging to the same track). It seems natural to believe that all these flashes concern the same object, but this must be a decision of a conscious observer. These flashes correspond to a sequence of NOWs. This sequence tells us about "before" and "after". In this way we observe the birth of time.

This picture seems similar to that created by philosophers. Thomas Aquinas says: IS undergoes evolution in course of a change. This allows a conscious observer to distinguish between "before" and "after"

in change. In this way we obtain time. There would be no time without a conscious observer (soul, anima – says Thomas) [2].

I have written that IS shows up in physics as a flash. This is coherent with the fact that every IS shows up as a NOW, which immediately vanishes giving room to another NOW. My IS is on an edge of a knife (*Messers Schneide*) says Edith Stein [4].

I am not discussing here a number of problems such as: superposition of states, complementarity, decoherence, Schrödinger's cat and others. I have concentrated on the basic scenario, which is not much perturbed by doubts concerning interpretation problems.

As an exotic aspect of these considerations we may rise a question: is TIME composed of separated events, corresponding to a sequence of reductions of the wave packet? Is it hence represented by the cardinal number \aleph_0 (aleph 0) or is it continuous?

The problem of a conscious observer which appeared in these considerations seems to be a very subtle one indeed. We saw that it was needed for actualisation of probabilities and for perception of time. Quantum physics teaches us also that it is necessary for a decision which actualisation we expect: for instance that of the location or that of the momentum. We also know from experiments with photons passing through slits that the interference will not take place if the observer is able to know the path of the photon for sure. A role of the observer seems to be doubtless, but what about times when no human observers were present?

Perhaps we should expect a clarification of these problems when the notion of information will be included into metaphysics.

3 Universals

The existence of universals remains a problem in philosophy for ca 2500 years more or less. In this essay I shall not discuss universals such as: “redness” or “joy”, whose status – *ante res* or *in rebus* – is being discussed. I want on the other hand to deal here with universals belonging to mathematical objects, i.e. with numbers, geometrical objects, other mathematical notions, theorems and also laws of physics and laws of other sciences. A majority of mathematicians believe now that mathematics has not been invented – it was discovered. Which means that there is a “sphere” where such

universals ARE – a “sphere” of beings *ante res*? Thus, abstract forms belong to a “world” where they are “waiting” for being discovered. They did not appear as forms constructed by human minds. Among them we have laws of physics – they are Platonic forms which are being discovered by the theoretical physics.

What shall be included in a universal *ante res* could be perhaps a matter of discussion. How about models? Or/and approximations?

There is a contact between “our sphere” of the actual existence and the “sphere” of pure universals. Number 5 belongs to the “sphere” of universals but “five apples” transfers it to the “sphere” of actual being (in rebus). More about that will be in the next chapter.

4 Hylomorphism and the laws of physics

Hyle + morphe = a material being which actually IS. Hyle denotes matter and morphe – a form “constructing” a being of it. The hylomorphism hypothesis declares that every material being is a “composition” of a material (Stoff) and something which makes a thing of it. This chapter, as concerned with material objects, shall be in frame of interest of a physicist. But the concept of hylomorphism was invented by philosophers with a leading role of Aristotle. For the author of this essay it seems essential to ask about a coherence of the hylomorphic hypothesis with what the modern physics suggests. What, according to physics is *hyle* and what is *morphe*?

It seems that *hyle* (understood as *materia prima*) creates more problems than *morphe*. Therefore I shall first discuss the notion of form. We are touching here again the problem of universals.

I declare that notions and formulas of mathematics are *ante res*. I am following here the idea of Staruszkiewicz who says: “The theoretical physics looks for mathematical structures which are Platonic patterns of physical objects” [7]. Hence, a mathematical formula which describes the physical object I consider as a form (*morphe*) actualizing the object. In this way the Maxwell equations are forming the electromagnetic field, the Dirac equations are forming the electron field etc. As universals, these physical patterns ARE in a “sphere” different from the “sphere” of actual IS. They are (sort of) “waiting” for a composition with *materia prima* i.e. for actualization in “our sphere”.

In view of these considerations it seems that there is no difference between what we call the laws of physics (science) and the *ante res* forms – the Platonic patterns of physical objects. The laws of physics belong therefore to the “sphere of universals” and are hierarchically above phenomena of physics.

Extrapolating these thoughts we may say that the laws of ethics are the laws of the soul which is the *morphe* actualizing the human body, when the free will has to be taken into account.

The problem of *hyle* is more difficult. Aristotle says that *materia prima* has no actual being. It is a potential being only. Its actualization occurs when it is formed via *morphe*.

Such a point of view represents also A. Kr a piec [8]. But Edith Stein penetrates this problem deeper. The unformed matter (she says) is an introductory degree of actuality. The word “potentiality” has not just one sense. We are touching here the problem of “Wortschatz”. The potentiality in the Aristotelian sense coincides with the word *Möglichkeit* in German. But another word in German is *Vermögen*, which is a potentiality but for defined actualizations. As such it cannot be completely undefined. Therefore it cannot be just nothingness. It is undefined but not completely undefined. Hence (says Edith Stein) there is something intermediate between nothingness and actual being [5] – and this is *materia prima*. On the road to actual being (*zum wirklichen Sein*) we find a realization of *Vermögen*, which is on a certain level of *esse*. Hence we have levels of *esse*. *Materia prima* is on the lowest level.

Tentatively I suggest to identify *materia prima* with the ground state of the field. As an example I shall present a picture based on one type of field – the crystal field discussed in various problems of the physics of solid state.

Let us present the crystal as a system of small spheres distributed regularly in the three dimensional space and interconnected by tiny springs. The ground state of such a crystal let be just a construction without any dynamics. Now let us introduce a motion, for instance via a deviation of a sphere from its proper position and releasing it. Since the spheres are interconnected by springs, the sphere will start oscillations, which will transfer to the surrounding spheres, then to the next etc. Thus a wave of oscillations will be created. By loading the crystal with more energy we may introduce more such oscillations.

Each such oscillation may be called a phonon.

Hyle – the crystal in its ground state, has no phonons, but is a basis (*das Vermögen*) for creation of phonons, which occurs via an action of *morphe*.

5 The truth

A definition of the notion of the truth we may find in every philosophical dictionary or/and in every handbook of metaphysics. Thomas Aquinas declares that “The truth is a correspondence of intellect and things (*Veritas est adaequatio intellectus ad rem*) [3]. But perhaps there is no truth? Pilatus asks Jesus: “*Quod est veritas?*” which may be translated as “what is the truth?” but also “Is there something like a truth?”. Doubts concerning the truth are declared by postmodernists today. Some of them speak about the relative truth only, doubting in the absolute truth.

The S. Thomas definition of the truth just formulated locates the truth in the mind (*intellectus*) of a recognizing agent. This is called in metaphysics the logical truth. According to the so-called coherent theory [9] the truth declared must be coherent with the general picture concerning the reality (the universe). As a physicist I am attracted by this theory since it demands what I do when performing research. The total coherence, not only a fragmental one.

A location of the truth in the recognizing mind seems to cover only a part of the problem. “True” is also declared in connection with that what IS a subject of the recognition. We say “a true gentleman”, “or a true gold” etc. Such a truth – located in the recognized object – is called the transcendental truth. It connects the truth with the being. The truth becomes an aspect of being. The list of such aspects is: being, thing, one, something, good, true (*ens, res, unum, aliquid, bonum, verum*) [6].

Hence the transcendental truth is connected with a being, i.e. with IS. That what IS is (as such) true. It has the truth. Perhaps it may have also lacks of the truth. But it is no doubt involved in the truth. The truth is not just located in the mind of the recognizing agent (as it seems to be suggested in contemporary handbook of metaphysics) but also is being transferred to what IS. Some thinkers are then tempted to say that it must be transferred to what IS in a deepest sense, i.e. to God.

To manipulate with an extrapolation is always risky. There is always a danger when we use our vocabulary in connection with God. One danger shows up when we transfer to God the word recognition (Erkenntnis). God does not carry on a research. But His knowledge is a recognition of a Creator about what He creates. The creative idea present in God's intellect is a basis of the truth in created things.

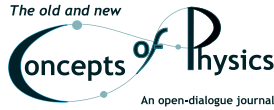
Another improper word in connection with God is the word "has". Instead of saying that God has the truth about what He creates, we say rather that God is the truth. And here our considerations meet the words of Christ: "I am the road, truth and the life".

In this chapter I said nothing about the semantic concept of the truth. Great achievements were obtained in this matter by Alfred Tarski [10]. But his writings are beyond my competence.

References

- [1] J.A. Janik, CONCEPTS OF PHYSICS, **II**, No 1–2, (2005), p. 39
- [2] Thomas Aquinas, *Super Physicorum* IV, 17
- [3] Thomas Aquinas, *De Anima* 3, ad 1
- [4] Edith Stein, *Endliches und ewiges Sein*, Herder, Freiburg-Basel-Wien, ch. II §1, p. 38 (1986)
- [5] *ibid*, p. 173
- [6] *ibid*, p. 264
- [7] A. Staruszkiewicz, in: *Nauka-Religia-Dzieje* (in Polish), J. A. Janik ed., Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków (2000), p. 55
- [8] A. Kr a piec, *Struktura bytu* (in Polish), Redakcja Wydawnictw KUL, Lublin 1995, p. 252
- [9] C.E.M. Joad, *Guide to Philosophy*, Dover Publications, New York (1957), Ch. 16, p. 432
- [10] A. Tarski, *Logic, Semantics, and Metamathematics*, J. H. Woodger ed., Indianapolis (1983), pp 37–54.

Comment



www.uni.lodz.pl/concepts

Comment on BORDERLAND BETWEEN PHYSICS AND METAPHYSICS

Michał Tempczyk

Nicolaus Copernicus University

Faculty of Humanities, Collegium Minus

Fosa Staromiejska 1a, 87-100 Toruń

Physics, as a fundamental science on Nature, attempts to create general pictures of matter world and therefore its concepts and results are strongly related to Philosophy. These close relations are particularly important when physics goes through a crisis and old concepts and theories lose their efficiency, so a strong need for new concepts and theories arises. Such a crisis of Physics has begun a hundred years ago with the birth of Theory Relativity and Quantum Physics. Scientists and philosophers while using basic philosophical notions, make efforts to put in order all what what Physics in general, and Quantum Mechanics, in particular, says about our world. J. Janik's article is a good example of such an effort and clearly shows that there is still a lot to be done. Having based his considerations on on classical metaphysics elaborated by Aristotle and S. Thomas Aquinas, the author ponders also "classical" problems of being, of universalities, of the essence of time and truth and discusses them from the point of view of modern physics. The language of S. Thomas's metaphysics

can be easily acquired to classical physics since it describes Nature as an assembly of individual (substances), which are properly defined in structure and properties. In Quantum Mechanics, however, such an approach leads to paradoxes, among which the most known is the wave - particle paradox. Therefore there is a desperate need to seek a new, suitable philosophical theory. Such a new philosophy should see the world as a process. Janik is convinced that Martin Heidegger's philosophy is that one, which the most suitably describes world as a process of changing. The fundamental concepts of the new philosophy are processes, flows and time. And time is considered as a product of the human mind.

The philosophical task, Janik faces, is challenging. On one hand, he shows the restrictions for classical metaphysical concepts trying to interpret them in a new dynamical way, while from the other side he uses modern physics in order to defend S. Thomas and explain Thomas's hylomorphic theory offering it new and interesting interpretation in accord with Quantum Mechanics. In this interpretation the primary matter (*materia prima*) is a fundamental quantum field and all forms are interpreted as processes appearing on such background. The example of the crystal and phonons is important here. I consider this approach as agreeable with inflationary cosmology which sees the beginning of the Universe sees in the quantum Higgs field.

The last Chapter discussed substantial absolute concept of truth that goes behind the philosophy of physics, because physics as empirical science must experimentally verify its results appealing to the relative concept of truth based on the adequacy of the intellect and the world.

I have some particular remarks:

1. At the beginning of his paper Author uses the term "language" in three different meanings without distinguishing them:

- a) the ethnic language. e.g. English, Greek, Latin;
- b) the philosophical languages, e.g. of Thomas Aquinas, of phenomenology, logical empiricism, monadology;
- c) the language of scientific theory, e.g. the languages of mathematics or physics.

This confusion of different notions creates difficulties in understanding the paper. For example, how to understand the question

Comment

of what language satisfies philosophical needs. What kind of philosophy? After all philosophy is a collection of many different systems each of which uses its own language.

2) I doubt if a position and a momentum of a bullet may be treated as its substantial properties. It seems to me that these are relative properties and only mass of a bullet, its structure and size are substantial properties. Similarly, the substantial properties of the electron may be its mass, electric charge and spin, which are independent from the observer.

3) Is the sense of time specific only for human beings? It seems that also animals like dogs, horses, monkeys etc. feel a flow of time. The concept of time, however, is certainly the human invention.

4) The Author considers the laws of physics as *universalia*. I think that to this role are better suited the solutions appearing by their use. Let us take Schroedinger equation as an example which while being applied to a description of hydrogen atom results in universal structure of electron orbits. The same structure can be obtained by using the matrix Heisenberg mechanics. One has two methods to describe the atomic structure which is more fundamental than laws generating it. Laws are different but the structure is one. Laws depend on the mathematical formalism used, when the structure of light generated by the hydrogen atoms is universal.