Review of: "Knowledge Arguments for Time"

Thomas Görnitz[1]

1 Johann Wolfgang Goethe Universität Frankfurt am Main

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Thomas Görnitz

Department of Physics

Goethe University Frankfurt/Main

goernitz@em.uni-frankfurt.de

Some remarks on

Paul Merriam: Knowledge Arguments for Time

This is not a philosophical review of Paul Merriam's work. Rather some thoughts from the point of view of a physicist are given, which – at least according to my perception so far – can enrich the philosophical reflection initiated by Merriam.

One goal of philosophy is certainly to consider all the possibilities that the human mind is capable of developing. This is much more than what we find in the empirical. Counterfactuals or the ideas of "zombies" belong to it.

Also, in physics there are many considerations, whose fantasy-leadenness can be seen quite likewise. However, in the end in physics the necessity remains to carry out a check of its models on what can be found in nature.

The famous example of "Mary and the color qualia" is often presented in such a way that one can discuss whether Mary will learn something new during the first "self-experience of color seeing", which goes beyond the comprehensive knowledge of natural science, which she has acquired according to the hypothesis.

Since Mary knows white light - that is, all colors, but without any differentiation between them - all cones of the retina will be able to develop properly in her eye. As a natural scientist, however, I wonder whether, after growing up in a purely black-and-white world, it is at all possible in terms of brain physiology to then be able to differentiate between different colors with the completely untrained visual areas. Probably the developmental window for this will have closed long ago. But counterfactual considerations are nevertheless useful.

The author begins his philosophical considerations with McTaggart's distinctions between B and A series.

From a natural science perspective, the B-series could be seen as the universal time of cosmic evolution. The A-series, on the other hand, corresponds largely to a living being's subjective experience of time.

Then the argument of "Mary" is explained in detail and transferred to the problem of time. Thereby the discussion begins with the statement:

"(2.1c) There are non-physical facts about human color vision."

Possible conclusions about combinations of perceptions or living/experiencing in A or B times and changes between them are then listed.

Thus, a total of 648 knowledge arguments for time are given and pointed out where there might be cross-fertilizations with philosophy of mind.

This is all interesting and certainly meritorious.

However, as a physicist, I also wonder which of these many thoughts best fit our daily experience, that is, everyday experiences, as well as the thought experiments and the experimentally found insights associated with them. Of course, it remains the task of philosophy to question unreflective everyday perceptions again and again. But with such a questioning one should also consider conclusions, which result from well-founded investigations at and in nature and which moreover prove themselves in their conclusions.

Therefore, a side view on natural science or from natural science is allowed.

The argumentation "physical facts" versus "non-physical facts" corresponds to a dualistic world view. How could one classify this today?

The answer to this does not only concern the different aspects of time, but it also concerns in a fundamental way the philosophy of mind.

Quantum theory has made it possible to improve a conception that is two thousand years old. This conception is based on the fact that one looked for the simplest and thus the most fundamental with smaller and smaller particles. This was quite successful for a long time. It changed with quantum theory.

Planck's formula and the ever more gigantic accelerators show that ever smaller structures are coupled with an ever-increasing energy. An ever-increasing energy density can hardly be understood as an indication of ever simpler structures. Quantum theory thus shows that ideas about particles are losing their historical role.

The simplest structures that natural science can deal with have a state space that is only two-dimensional. Two numbers suffice to define the state. One can call these structures quantum bits. From them the material particles can be constructed mathematically and theoretically. To determine the state of such a particle, infinitely many numbers are necessary.

With quantum bits also an access to the mental structures was opened.

Physics can be understood thus as that part of the natural science, which deals with the simplest structures, which can be

found in nature. Their simplicity makes it possible that the physical structures can be modeled even with the present mathematics.

Chemistry explores structures in nature that are much more complex. Biology deals with a further level of complexity. In the field of living things, after a long evolution, living beings with consciousness and finally humans with language and writing develop.

Since the simplest structures are the basis for all more complex ones, the conception also of something "non-physical" was a necessary result of the classical physics and its concentration on the matter. In classical physics, the reality of the mental, including consciousness, could be formulated at most with a dualistic picture of reality. Often the reality and efficacy of the mental was even denied and only the brain was granted an ontological reality.

A completely new picture emerges when modern quantum theory is taken into account.

One of the fundamental principles of quantum theory is that a combined system builds itself multiplicatively from its possible parts. This is a central difference from classical physics, in which the parts combine additively.

Quantum theory is thus a "physics of relations." Relations bring forth something new. Such a new thing is then "more than the sum of its parts".

Thus, our planetary system is grasped as a classical system, if one knows the places and velocities of all eight planets, thus 8 times each 3 position and 3 velocity coordinates. A molecule however is something completely different than the sum of the atoms from which it was built. The mixture of hydrogen and oxygen, known as an oxyhydrogen gas, is something completely different from water.

Quantum theory describes how many simple things can become something complex with completely new properties. It provides the scientific theory to a mere use of the term "emergence".

Therefore, quantum theory has also become the theoretical basis of chemistry, which uses molecules to create structures completely different from atoms.

In the quantum theory it became possible to go over to the actually simplest and therefore actually fundamental structures.

The classical physics has the fantasy that the simplest structures would appear with the "point particles". In order to specify the state of such a classical particle exactly, 6 numbers are sufficient as described, three for the position coordinates and three for the velocity coordinates. The much greater accuracy of the quantum theory is shown by the fact that for the exact determination of the state of a quantum particle, as already mentioned, infinitely many values are necessary.

For the simplest quantum structures, which are mathematically possible, already two numbers are sufficient for the determination of the state, as said before. Such quantum systems are usually called quantum bits.

That with such simplest quantum structures the objects of reality can be generated was already considered and suggested by Carl Friedrich v. Weizsäcker at the end of the 1950s. In his book "Aufbau der Physik"[1] (Structure of Physics) in 1985, he had summarized the results of his theory of "primordial alternatives" at that time.

The designation "qubit" tempts to think of information with all its references. However, the "meaning" always thought along with the term "information" has always an essential subjective part. This subjective and context-dependent part cannot be captured in an "objective" science like physics. However, quantum theory can show how the phenomenon of "subjectivity" can be justified scientifically.[2]

A crucial difference to quantum information as used in quantum computing, for example, is the transition to understanding a cosmic fundamental quantum information as Absolute Bits of Quantum Information, AQIs. They are therefore "absolute" because they are related to the "whole". Therefore, they are to be understood as structures extended over the whole cosmic space.

It was necessary to let this difference become clear to a usual conception of "information". In the common linguistic usage information is provided with a "special meaning". Therefore, for the totality of the AQIs, which are to be thought primarily as still meaning-free, the term "protyposis", "the pre-coined" was introduced.[3]

With the AQIs of the protyposis, the equivalence between matter and motion (physically: energy) can be extended to an equivalence of matter, motion and the very abstract, because absolutely defined information.

Based on this new physical knowledge, the statement (2.1c) can also be formulated like this: There are "objectifiable facts" and there are also "subjective facts".

Important for an understanding of reality is the insight that real effects can result from both. Just as the brain acts on its consciousness, the contents of consciousness act back on neural networks.[4]

The current state of a conscious mind can be known only to that mind. It is impossible to know a foreign consciousness exactly. At most a quite approximate knowledge is possible.

That there is no sharp distinction between the natural science and the subjective is shown by the quantum theory. Namely, it holds:

It is impossible in principle to be able to recognize exactly the actual state of an unknown quantum system.

With an ideal measurement one can know the exact state after this measurement. Afterwards this is known. Another identical measurement will confirm this. But this now known state has only little in common with the state of the system before the measurement.

One can interpret this as a "germ of subjectivity" which already appears in inanimate nature.

When thinking about the aspects of time, another basic feature of quantum theory comes into play: Quantum theory is the physics of possibilities![5]

The mathematical structure of quantum theory is strictly deterministic. However, in a fundamental difference to classical physics, this determinism does not describe the development of facts, but rather the change of possibilities.

For a closed quantum system there are no facts. Only by a relation to the area outside of the system a fact can be set. Only with this a distinction becomes possible between "before the fact" and "after the fact".

For historical reasons, such an acquiring of facts is called a "measuring process". The occurrence of facts consists in a loss of information about quantum possibilities. Their variety is limited to one of the possibilities and the information about the possibilities co-existing before escapes from the system. In case of a particle, only the few numbers of a classical description remain from the infinite values of the quantum precision.

Facts appear always and everywhere and are not bound to a human consciousness but to a "dark night sky" in a "cosmos expanding with speed of light".[6]

But of course, a consciousness is necessary for a statement, registration and interpretation of a fact.

What do the "night sky" and the "expansion" mean for the understanding of the time?

The information about the quantum possibilities which have not become factual is essentially carried away by photons. Since photons of the same energy are indistinguishable, the physics of the "quantum eraser" shows that the loss of information by a departing photon can be replaced by an identical incoming photon.

In the present cosmos, the incoming photons on the earth from the cosmic background radiation have a temperature of 2,7 K. Therefore, the sky is black. In the daytime, however, we see nothing of it because of the illumination of the atmosphere by the sun. The outgoing photons from the earth have an average temperature of about 300 K. They are much more energetic than the cosmic background radiation. Therefore, outgoing information cannot be replaced by incoming information.

This changes the closer we go to the initial phase of cosmic evolution. At that time, the cosmic background radiation was extremely hot. For every outgoing photon there were identical incoming photons. The occurrence of facts, i.e., the loss of information about a quantum state, becomes less and less probable the closer we theoretically approach the beginning.

Empirical science is based on making predictions for future development based on past facts. But if it follows from its results that this condition is not fulfilled, then it shows its own application limit there, i.e., at the beginning of the cosmic evolution. To show own application limits is a high-quality characteristic for a theory.

In special relativity theory it is shown that systems which move relative to each other have different proper times. From this follows that not only the clocks, but also all other processes are affected by a different time. As a note the following is valid: Moving clocks go slower.

To this belongs that for photons which move with speed of light, the proper time is zero. Also, for photons, which are on the way many billions of years from our point of view, emission and absorption coincide.

In general relativity theory different time sequences are also shown for different gravitational effects. In the stronger gravitational field (or with larger acceleration) the time passes more slowly. In the so-called twin paradox, the twin flown away and returned is then the younger of the two because of its greater accelerations.

In quantum theory there is no passage of time in a completely isolated system, there is an "extended present". Because of the isolation, the information loss necessary for facts is prevented.

Such an "extended present" can be experienced under circumstances in special mental situations.

If we consider the cosmos as a whole as a quantum system, there is another very strange consequence for time. Even mainstream investigations of "quantum cosmology" emphasize that there is no time in it. This is consistent. If facts originate from the fact that information escapes "in the depth of the universe" on never return, then nothing can escape for the cosmos as a whole into the "depth of the universe".

From this would follow that the time process with its subdivision by facts exists only for localized areas of the cosmos, thus for example for the earth or for galaxy superclusters.

To these described physical structures of the external time correspond similar temporal aspects in the psychic, thus in the unconscious and in the consciousness.[7]

The different aspects of time, which can be derived from empiricism, probably coincide only partially with the subdivisions of Paul Merriam, but are also important for a philosophy of mind.

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