Dear all,

I would like to add a few comments about Cloud 5.

If information is indeed the fundamental entity, an opinion I share, then it is necessary to tie it to the natural sciences and especially to physics as their foundation. That is why I have been developing the consequences of a theory of abstract quantum information, AQIs, as a new basis for physics for a long time.

The basis of physics is provided by quantum theory. Its essential aspects are:

1. Quantum theory is the physics of the precise. Only when it really has to be or becomes very precise does quantum theory come into play.

2. Quantum theory is so precise that it can grasp that mere possibilities can produce real actions.

This concerns such possibilities that cannot be imagined as unknown facts, as in classical probability theory. In our everyday behavior, it is natural for us to also be influenced by pure possibilities, that is, by possibilities that have not yet become unknown facts.

3. Possibilities combine multiplicatively. This corresponds to the fact that in quantum theory, the state space of a complex system is constructed by the tensor product of the state spaces of those parts that combine to form the complex system.

The explanatory principle of science is to construct complex systems from simple systems. Due to the tensor product, in quantum theory the system as a whole has many more new and different properties than the sum of the parts from which it was constructed.

This mathematical explanation of the New and Different no longer makes it necessary to use the concept of emergence for the transition to something new.

A quantum particle has a countably infinite-dimensional state space and a quantum field has an uncountably infinite-dimensional state space. This obviously has nothing to do with simplicity.

The simplest possible quantum structure has a two-dimensional state space. Something simpler is impossible.

So far, a two-dimensional state space is usually assigned to a property of a quantum particle, e.g. its spin or polarization.

Carl Friedrich von Weizsäcker was the first to point out the possibility of constructing quantum particles from – as we would formulate it today – quantum bits with his theory of Ur-alternatives, which he developed in the 1960s, based primarily on philosophical considerations.

In 1972, Weizsäcker put forward the thesis that a proton is 10^40 Ure, i.e. quantum bits.

Weizsäcker used the term information in the way it is generally used, as something that has a meaning. He rejected an absolute concept of information.

However, this overlooks the fact that in cosmic evolution, meaning can exist for the first time for the first living beings. Before the existence of life, there are forces, but for planets or stars, nothing has meaning.

Meaning always has a large subjective component, but physics aims at the objective.

In 1980, Weizsäcker had also invited John A. Wheeler to the 4th conference on the Ur-Theory and its consequences. Wheeler spoke there about “The Elementary Quantum Act as Higgledy-Piggledy Building Mechanism.” In 1990, Wheeler then gave a lecture with the title “It from Bit”, which is still very advertising-effective today.

A crucial step for the later successes was to become even more abstract than Weizsäcker.

The simplest structure must also be the one with the lowest energy. According to Max Planck's formula E = hc / λ, it must therefore have the maximum expansion. The simplest, an AQI, is therefore not a small particle or anything spatially tiny, but a cosmically extended structure. Only 10^41 of them can form something as localized as a proton.

Since “information” in normal language use is always understood as laden with meaning, it has proven useful to introduce a new term for this form of abstract and absolute quantum bits, for the AQIs: “protyposis”, “that which is pre-embossed”.

Since one can certainly not imagine anything under this term, one cannot develop any misconceptions with it.

Matter itself and also the properties and forms of matter are special formations of AQIs. They can be transmitted between sender and receiver by photons, which are also structures made of AQIs.

Properties can become significant information for living beings by causing actions.

This is certainly understandable.

A lot of research work has been done since Weizsäcker's beginnings. It was shown how the particles of relativistic quantum mechanics can be constructed from quantum bits in Minkowski space without and with rest mass. [[1]](#endnote-1), [[2]](#endnote-2)

· It was explained why the gauge interactions of the electromagnetic, weak and strong interactions have the precise groups U(1), SU(2) and SU(3). [[3]](#endnote-3), [[4]](#endnote-4)

· A cosmological model was also developed. [[5]](#endnote-5), [[6]](#endnote-6) For this, it was shown that with the abstract and still meaning-free quantum bits, AQIs, the phenomena for which inflation, dark energy and dark matter were invented either do not exist or can be explained. [[7]](#endnote-7)

The many particles that have been invented for these three postulates have so far eluded all observation and experiment.

Such a new scientific understanding of matter and also of quantum information has made it possible to explain consciousness in a scientific way.

The brain is the tool necessary for the generation of consciousness. Consciousness is a structure of AQIs that can appear as the entangled properties of entangled photons localized in a living brain. Consciousness acquires its meanings in the course of biological evolution and individual development.

Now, with the AQIs, it has also become understandable that consciousness can produce real actions on the brain and, through it, on the rest of the body. [[8]](#endnote-8), [[9]](#endnote-9), [[10]](#endnote-10)

An overview of this theory as it stood in 1985 is available in German and in the translation of Weizsäcker's work “Aufbau der Physik”. [[11]](#endnote-11) A more up-to-date summary is available in English in a Springer Essentials. [[12]](#endnote-12)

A detailed description of the mathematical structure and the philosophy of quantum theory and its implications for our understanding of life and consciousness exists in German. [[13]](#endnote-13) An English translation is in preparation.

In summary, I can state once again:

The simplest quantum structure for mathematical reasons, an AQI, has a two-dimensional state space. Because of this mathematical structure, it is often referred to as a quantum bit, although it is not yet information in the sense of meaning.

But the AQIs develop both material objects as well as their properties. Properties of objects and structures can become meaningful information for living beings. Structures of meaningful information are ultimately also the thoughts in our consciousness.

This touches on **Cloud 1 and Cloud 2**. Properties of DNA form the behavioral recipes for all life forms – **Cloud 3**.

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