Thomas Görnitz: Quantentheorie verstehen: Grundlegende Vorstellungen und Begriffe. Carl Hanser Verlag 2022

Axiomatic theses are considered as (tacit) assumptions that are presumed for the acquisition of scientific insights. They form the scientific paradigm without which academic work is not possible. In the natural sciences, an axiomatic thesis is considered fruitful for two reasons:

a. if it leads to theoretical predictions that essentially stand up to empirical scrutiny
b. if it offers significant conceptual advantages. For instance, if it enables insights into novel relationships or if it offers conceptual clarifications that help to overcome existing boundaries of knowledge.

The new book by Thomas Görnitz gives a novel presentation of quantum theory and spans the arc from particle physics to cosmology and incorporates aspects of the psychology of consciousness without falling into the esoteric abysses popular with some authors. In doing so, Görnitz develops a theoretical framework far away from the "mainstream" of contemporary physics and fills it in essential parts in an exemplary, comprehensible and convincing way, thus emphatically aiming at the second part of theoretical fertility.

In short, the underlying axiomatic thesis is that the origin of everything spiritual and all material consists in non-local information, beyond space and time. The basic building blocks of information are so-called abstract quantum bits, as described in quantum physics or quantum information theory (using vectors in a two-dimensional complex-valued vector space).

The associated worldview is undoubtedly not a dualistic one, in the sense of the mind-body theory of Descartes and his successors. And, of course, it is not a materialistic worldview that tries to reduce everything spiritual to material, as current mainstreams of neurobiology try to do. The world view represented here comes closer to the double aspect of Spinoza, which sees mind and matter as two aspects of one origin. Spinoza calls this common origin "God". It should perhaps be noted that Spinoza's concept of God is fundamentally different from the idea of God represented by religious institutions. (The great curse imposed on Spinoza by one of these institutions is a logical consequence of this fact)

In this short note, no comprehensive analysis and appreciation of the present book can be made. I shall confine myself to five brief remarks:

1. A common misconception of quantum theory is that it operates exclusively in the field of microphysics (elementary particle physics). Right at the beginning of his book, Görnitz dispels this misconception by dividing quanta into material, energetic and structural ones. The localization depends on the inherent energy: the greater the energy, the more localized the structure. Quantum bits as the basic building blocks of information lack any localization.
2. As far as material and energetic quanta are concerned, the author gives a very understandable explanation of the relationship between energy, particles, and dark matter. The author succeeds in conveying the basic ideas of this connection to educated laymen. Of course, there is also no lack of the appropriate formula material to provide students of physics with sophisticated care. It also explains a basic idea of modern particle physics, namely that particles are the irreducible representations of the Poincaré group.

3. The equivalence of mass and energy is extended to equivalence with quantum information. Insights from thermodynamics are used, an often underestimated theory of physics, about which Max Planck wrote a famous textbook as early as 1897. The origins of this conception of quantum information go back to Carl Friedrich von Weizsäcker, who coined the term "ure". However, Görnitz and his colleagues have developed this term considerably further, so that it enriches cosmological ideas of the present in a convincing and theoretically compelling way. In particular, the network of the terms *early black holes, horizon problem*, *inflation*, *dark energy* and *dark matter* is analyzed in a novel way, whereby the conventional cosmological standard model is questioned.
4. The concept of force plays a decisive role in the reanalysis of cosmological effects. As is well known, modern physics distinguishes four types of forces: the electromagnetic force (which keeps the electrons near the atomic nucleus and which is crucial for quantum chemistry), the weak force (radioactivity), the strong force (which holds the atomic nucleus together), the gravitational force (which, according to Einstein, causes the curvature of space). In basic physics, the fundamental forces are described by the exchange of structural quanta within the framework of quantum field theories. However, this leads to fundamental difficulties for gravity, which Görnitz pursues in detail. His suggestion: Gravity is not a force caused by the exchange of particles, but an entropic force caused by an inhomogeneous distribution of information elements in the universe, i.e. by an inhomogeneous entropy distribution in space. Finally, this results in corresponding forces and energy distributions. A similar view is held by the Dutch Nobel Laureate Gerardus 't Hooft and his student Erik Verlinde.
5. In the last two decades, the field of quantum cognition has developed by leaps and bounds. In this part of psychology, it is assumed that the mathematical structures underlying quantum physics can be usefully applied in theoretical cognitive psychology. This not only brings conceptual advantages of unifying a psychological theory, but also has effective empirical consequences, as has been shown in numerous studies by Aerts, Busemeyer, Pothos, Bruza, Atmanspacher, beim Graben and many others. In the present book, however, this aspect is hardly discussed and a justification of quantum cognition based on abstract quantum information is seen more as a task for the future.

The book is characterized by a clear language and finds an elegant didactic approach to even the most demanding problems, which avoids misunderstandings. This starts with the pair of terms possibilities/facts and the introduction of central concepts of quantum theory such as complementarity, entanglement, etc. based on it.

In terms of content, the book conveys a unified view of nature, which is essentially based on the idea of abstract quantum information. While standard cosmology stipulates complex quantum fields that have so far remained without any evidence of the necessary particles, the proposed cosmology based on quantum information does not need the assumption of certain particles. Instead, it solves the existing problems (dark energy, horizon problem, inflation, etc.) in a surprising and less stipulative way, but so far without direct empirical evidence, which is also lacking in standard cosmology.

A great advantage of the present work is a completely new approach to solving the mind-body problem and thus enabling access to a quantum information theory of cognition. This opens up an area of theory formation for which experimental psychology can also come up with empirical evidence, as recent developments show.