Hans Wehrli/20.10.2013

A Strategy to Find the Theory of Everything

Comment on Ioannis Raptis: Presheaves, Sheaves and their Topoi in Quantum Gravity and Quantum Logic (2001)

As a non-mathematician I comment this paper from the point of view of my metaphysical theory "Chirality as the Basic Principle of Physics (2008)".

1. The theoretical physics strategy of Raptis

1.1 Contradictions between the mathematical spacetime manifold used in general relativity and experimental physical observation

1.1.1 Pointedness of events: Such singularities are not observable
1.1.2 Continuous infinity of events: A continuum and infinity are not observable
1.1.3 Non-dynamical and non-quantal topology: Since every empirical observation is dynamic and discrete this topology deals with unobservable entities
1.1.4 Continuous topology is not observable
1.1.5 Non-operationality: Space and time are not observable as an existing background with a geometric structure. Theoretically they are observer-dependent (i.e.subjective) and not static.
1.1.6 Asymmetric time cannot be described by a topology as a theory of reversible, spatial connections. The theory should allow some kind of locality principle, where all observables are local variables propagating in temporal or causal directions.

1.2 The present theories for quantum gravitation (survey by Raptis)

1.2.1 The new theory should abandon events as singular spacetime points, but rather involve pointlessness and discreteness. The points should be replaced by something coarser or 'larger' such as open sets. There should be an ideal inverse limit of infinite refinement of an inverse system of finite locales ('finlocales').
1.2.2 Algebra over geometry: Information (observables) should be topologically represented by finitary spacetime-sheaves ('finsheaves': deutsch = endliche 'Garben'). Local topological information is more important than global information.
1.2.3 Temporality and causality over spatiality and topology (Sorkin): Order must be introduced by 1-way causal 'after' relations between events, so called 'causets' which encode almost(?) complete information.
1.2.4 Finlocales and their corresponding causets must be quantized (by a finite dimensional, complex(?), associative and noncommutative Rota incidence algebra which represents all topological information). This allows coherent quantum superpositions between the topological connections. These quantum topological substrata are coined 'alocal structures', i.e. they are neither local nor non-local. The quantized causets are called 'qausets'.

1.2.5 Curving a noncommutative topology for qausality: The topos-organization of the curved finsheaves of causets can be regarded as a (physical) universe of dynamically variable qausets varying under the influence of locally finite, causal and quantal Lorentzian gravity. The underlying logic is an intuitionistic quantum logic (Finkelstein: 'Logics come from dynamics').

1.2.6 Presheaves and their topoi in quantum logic and consistent-histories: Based on the Kochen-Specker theorem (Specker has invited me at his home in Zurich a few months before his death) in quantum logic truth is localized on (or relativized with respect to) the Boolean logics embedded in it. Isham assumed that there is a topos-theoretic perspective on the logic of the consistent-histories approach to quantum theory. One cannot assign truth values to propositions about histories globally, but one can only do so locally. The internal logic of the consistent-histories theory is neither classical (Boolean) nor quantum proper, but (locally) 'intuistionistic' and 'warped' relative to its 'local' classical Boolean sublogics.

1.3 The future strategy of Raptis' research

1.3.1 Mathematical physics should be based on noncommutative quantum causal Rota topologies leading to a causal topology of spacetime and quantum time-asymmetry.

1.3.2 Topoi and their topological relatives, locales, which are pointless topological spaces, will prevent the pathological geometric point-like character of a base spacetime manifold.

1.3.3 The quantale is the noncommutative (quantum) analogue of a locale. What is the corresponding analogue of the topoi?

2. Comparison of Raptis strategy with my metaphysical chirality theory

2.1 Raptis' critic

Raptis cites 84 references of authors such as Einstein, Finkelstein, Mallios, Penrose, Rota, Selesnik, Sorkin, Specker. All of them were thinking about new mathematics to describe physical observations. They did this from a rather philosophical point of view but nontheless they used mathematics that contradict the metaphysics of observation. My critic corresponds to that of Raptis in 1.1 and it even exceeds it in some respects:

2.1.1 Mathematical physics should do without any kind of infinity, i.e. even without irrational numbers such as π, e, $\sqrt{2}$

2.1.2 Empirical observations (= physical measurements) are not only discrete but also countable

2.1.3 A mathematical definition of the terms event and information is lacking

2.1.4 In my theory spacetime is (as with Einstein) simply a mathematical model and not an aspect of real nature. The only real entity is the event.

2.1.5 Order, asymmetry, causality and direction of time are a consequence of the basic chirality principle: $(a,b) \neq (b,a)$ or of my chirality axiom. Raptis does not mention chirality, but it can be derived from the arows of category theory, from the noncommutativity and from causality and time direction.

2.1.6 Black holes at Planck scale are mentioned by Raptis in section 2 'Non-operationality', but he does not really consider the idea. And black holes within black holes are no possibility for him.

2.1.7 It seems that Raptis does not consider non-local non-temporal actions without any information transfer as they are possible by means of virtual particles.

2.2 Possible physical interpretation of some of Raptis' ideas

2.2.1 The point events in Raptis' section 'Pointlessness and Discreteness', which he wants to replace by 'something coarser', i.e. by an open set, should be characterized as hv. h is the 'ideal inverse limit' postulated by Raptis, and v is a rational number of counted events.

2.2.2 The observable 'finitary spacetime sheaves' of Raptis are the bosons, i.e. differences between two states. Virtual bosons carry no information but they cause actions. As 'alocal' structures they don't obey the Pauli's exclusion principle.

2.2.3 The 'local topological information' of Raptis are the fermions. As 'states' they are never directly observable but important for the theory. As local stuctures they obey Pauli's exclusion principle.

2.2.4 Raptis' finlocales correspond to my 4-point-spaces. According to Raptis it should be algebraically possible to form coherent quantum superpositions between the topological connections defining the classical spacetime manifold. This probably solves some of the most difficult problems of my theory. It could allow the description of photons and gravitons as waves which are 'alocal structures' as Raptis calls them.

2.2.5 As in the case of quantum logic, the logic of consistent-histories is (locally) intuitionistic and 'warped' relative to its 'local' classical Boolean sublogics. In my theory this means that the neutrino as a local 4-point-space obeys Boolean logic. It does not change any of its quantum numbers during the perpetual periodic events of its existence. But observed from a presumed external observer the single points change their position with every event. This way there is always an uncertainty relating the precise position of the points and the possible interactions with points outside the neutrino. This might be the source of the uncertainty principle.

2.2.6 The quantale is the noncommutative (quantum) analogue of a locale. Raptis asks what the corresponding analogue of the topoi might be. My answer is, that the fermion might be a locale, whereas the boson is a quantale.

3. Strategy of our research

I think our strategy described in Hans Wehrli/12.09.2013: Comments to Döring, and in Christopher Bumgardner (2013): Proposal for a Theory of Physics from Chirality, still makes sense. Since many researchers have worked in the same field and asked similar questions as we do, we can use some of their results. Originally my approach has been very different from theirs. Since I am not a mathematician I started from general natural science and philosophy. My results are rather qualitative than mathematical. But as shown in 2.1 above my findings do not contradict the theories mentioned in Raptis' paper. I can answer many of the questions asked, interpret some of the mathematical propositions physically, explain many up to now unexplained physical phenomena and show the direction in which the research should proceed. Probably many of the ideas of the cited researchers are useful for our work. I have never read any paper in a scientific journal that describes a research strategy. As this seems to be possible I think we should consider writing a similar paper about our present strategy.