Expansions of Quantum theory towards Consciousness

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Lecture 2

12 prominent Quantum Approachs towards Consciousness

Quantum Approaches to Consciousness

1 consciousness as a manifestation of quantum processes in the brain

- **IDr** Henry Stapp: QT sufficient to understand influences of consciousness on matter
- **IDr** Beck and Eccels: quantum mechanical processes, relevant for the description of exocytosis at the synaptic cleft, can be influenced by mental intentions
- **RMr*** Roger Penrose & Stuart Hammeroff: Orechestrated Collapse of brain wavefunction
- **IMr** Umezawa, Freeman, Vitiello: Consciousness as vacuum states of quanum fields; Quantum Field Theory of brain states (QFT)

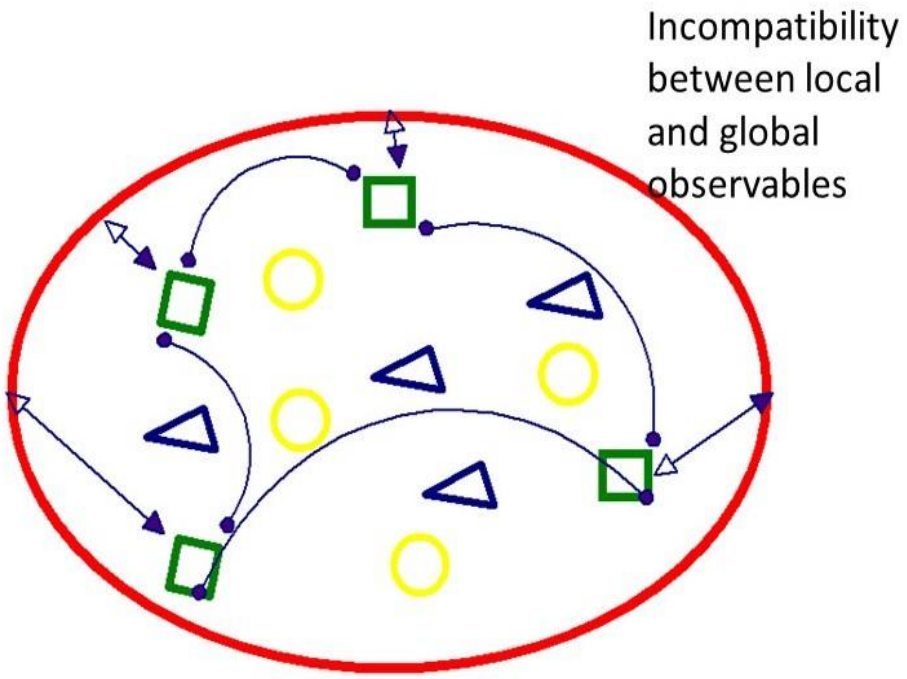
2 a quantum concepts are used to understand consciousness without referring to brain activity using new physical concepts

- **IMr** Atmanspacher, Wallach: Applying Quantum Concepts to Mental Systems; *quantum mind without quantum brain*.
- **RMr*** Roger Penrose: QT needs to be united with RT and GT to solve the enigma of consciousness
- **RMr** Burkhard Heim: Mathematical traces of conscious activities and qualities appear naturally in a 12 dimensional space
- **RM** Lee Smolin: It needs a fundamentally new physics to understand matter and consciousness

2 b matter and consciousness are regarded as dual aspects of one underlying reality.

- **IM** Wolfgang Pauli & C.G. Jung: Unus Mundus or psychophysical reality
- **RM** David Bohm; Basil Hiley, Paavo Pylkkänen : QT represented realistically so that consciousness appears in non-physical expansions of the theory (QFT)
- **IMr** Hans Primas: Quantum entanglement of physical and psychological time
- **IMr** Carl Friedrich v. Weizsäcker: Consciousness is related to holistic effects of Quantum Information which is more fundamental than matter and mind

IM Wallach, Atmanspacher: *quantum mind without quantum brain*.



- mental states defined on the basis of cells of a neural state space partition
- different partitions will generally create incompatible descriptions
- states may become entangled
- mental states and observables show features that resemble quantum behavior although the correlated brain activity may be entirely classical
- *quantum mind without quantum brain*.
- non-commuting operations or non-Boolean logic should be relevant, even inevitable, for mental systems that have nothing to do with quantum physics

Empirical Quantum Mind Effects

(i) decision processes

(ii) order effects

(iii) bistable perception

(iv) Learning

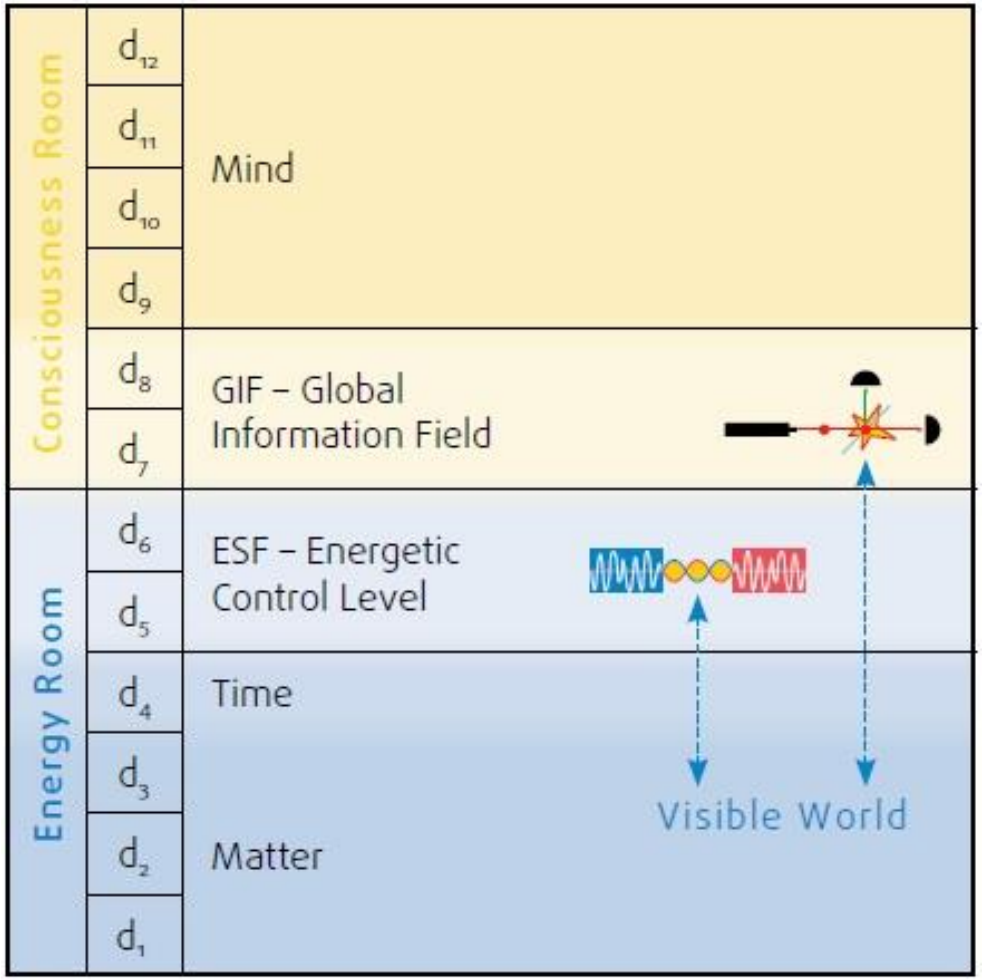
(v) semantic networks

(vi) quantum agency

(vii) super-quantum entanglement correlations

RM Burkhard Heim

Mathematical traces of conscious activities and qualities appear naturally in a 12 dimensional space



RM Lee Smolin

It needs a fundamentally new physics to understand matter and consciousness

1. Each framed conscious perception corresponds to the view of a physical event or law-bound sets of events.

2. Common events, which are those whose views have many near copies, are those described to good approximation by quantum mechanics as formulated presently. These are not correlates of conscious perceptions.

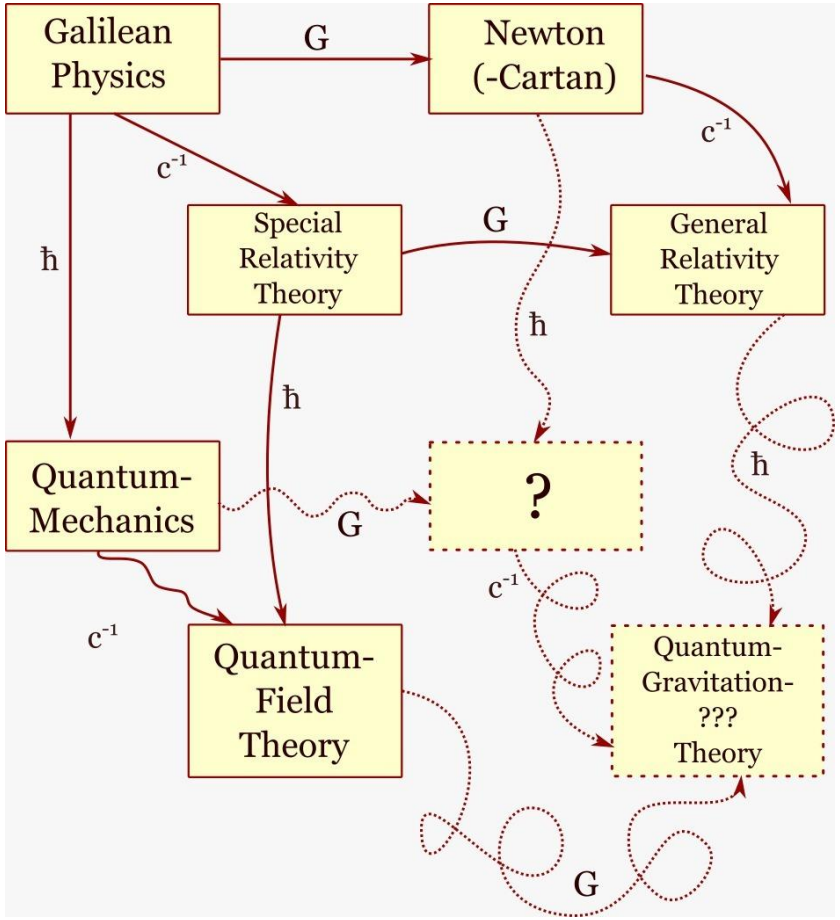
3. Only views of unique events or unique law-bound sets of events are correlates of conscious perceptions.

4. Only the top level of each hierarchy of ensembles of views are correlates of conscious perceptions. These are the first levels in the hierarchy which are unique single views, with no near copies.

5. Different qualia of the same modality (ie colours, tones) correspond to differences in energy.

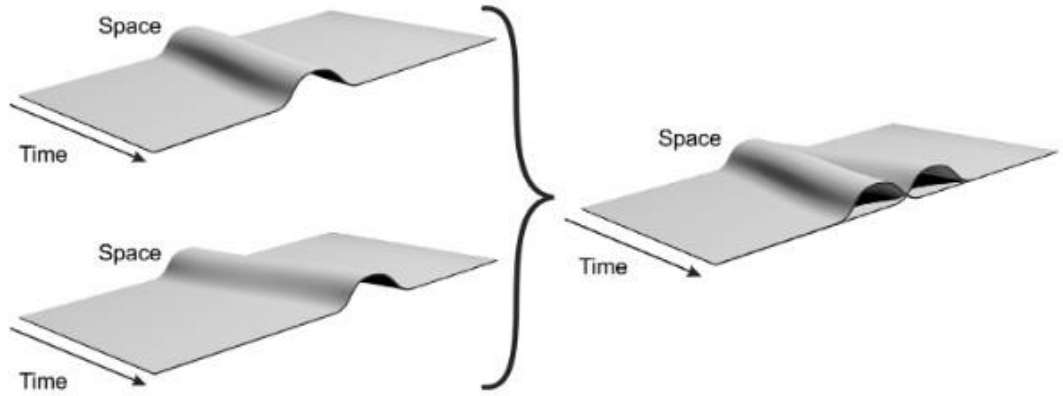
RM Roger Penrose

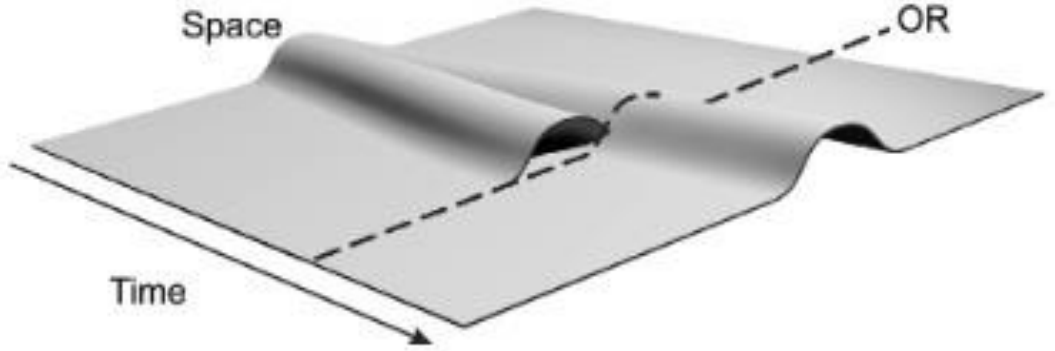
QT needs to be united with RT and GT to solve the enigma of consciousness



RM Roger Penrose

elementary conscious acts to gravitation-induced reductions of quantum states





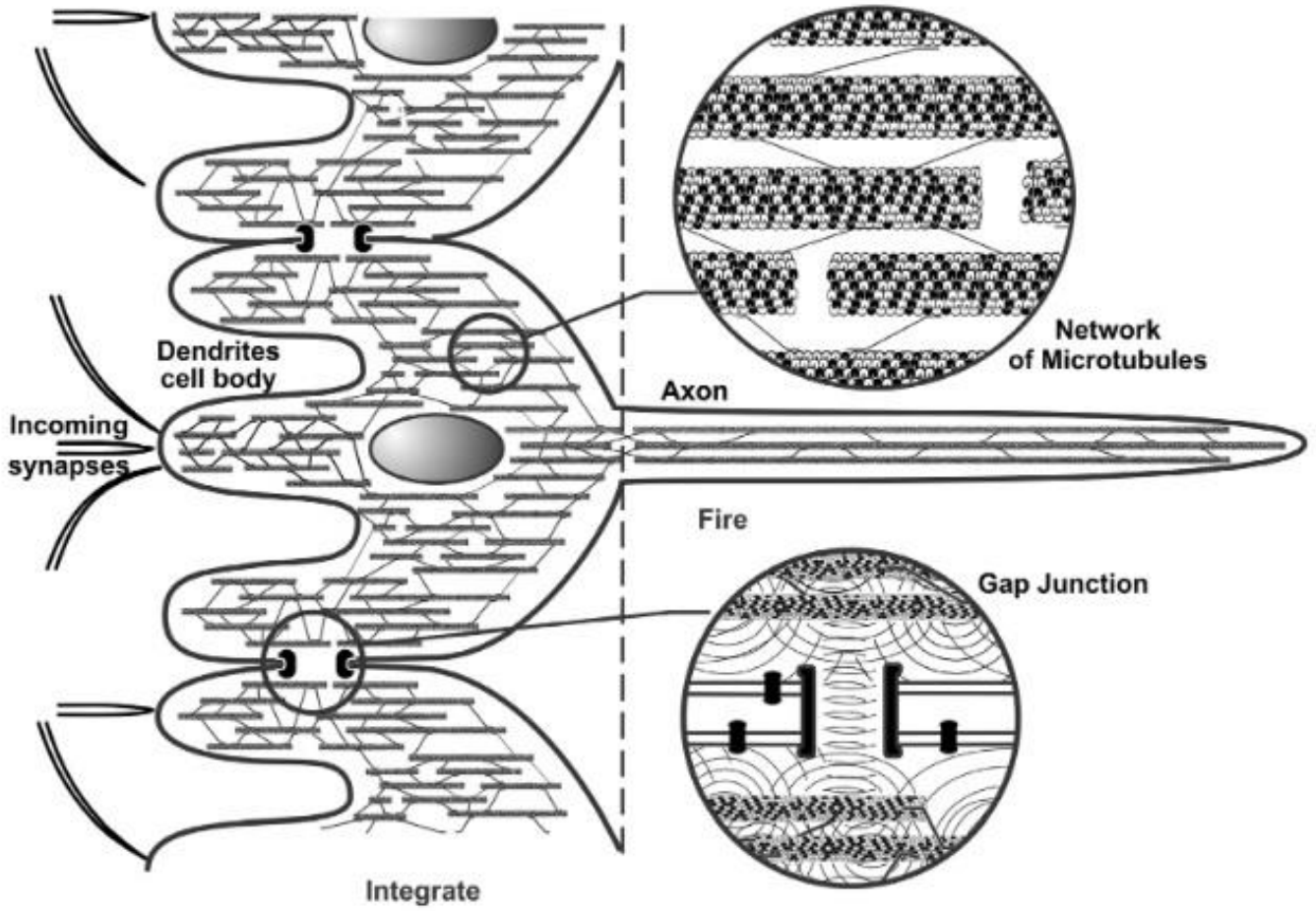
Non-computationality

We need an opening for a non-computational physical action if we are to find a physical home for consciousness. The only plausible place for such action is in a cogent replacement (OR) for the quantum-state-reduction process that I have denoted by R.

Penrose; Shadows of the Mind 1994

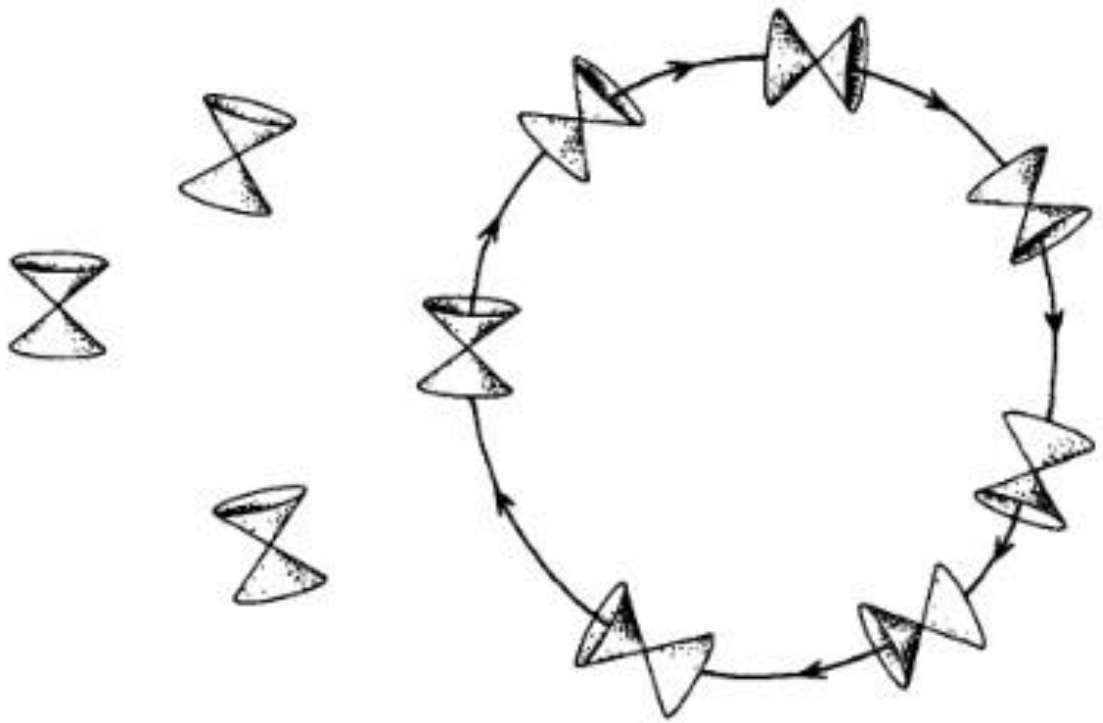
RM Roger Penrose & Stuart Hammeroff

Orchestrated Collapse of brain wavefunction - microtubuli as the place for state reductions



Penrose; Shadows of the Mind 1994

- strange quantum roles of counterfactuals
- neural computer enacts some computation which it does not actually perform
- the mere fact that it might have performed the computation causes an effect that is different from that which would be the case if it could not perform it



The physical basis of the mind

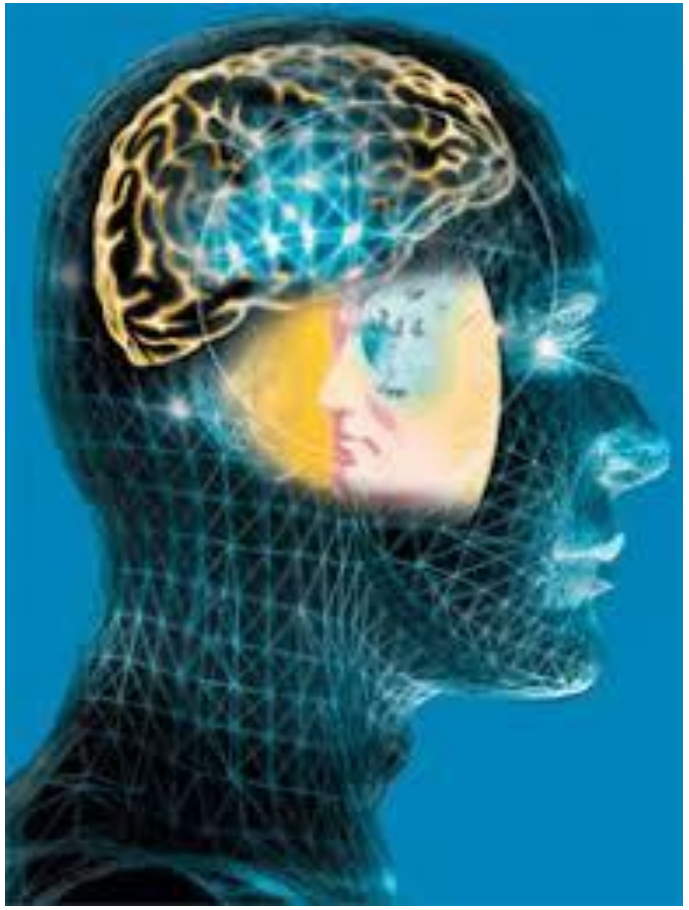
On the view that I am tentatively putting forward, consciousness would be some manifestation of this quantum-entangled internal cytoskeletal state and of its involvement in the interplay (OR) between quantum and classical levels of activity. The computer-like classically interconnected system of neurons would be continually influenced by this cytoskeletal activity, as the manifestation of whatever it is that we refer to as 'free will'. The role of neurons, in this picture, is perhaps more like a magnifying device in which the smaller scale cytoskeletal action is transferred to something which can influence other organs of the body-such as muscles.

Accordingly, the neuron level of description that provides the currently fashionable picture of the brain and mind is a mere shadow of the deeper level of cytoskeletal action-and it is at this deeper level where we must seek the physical basis of mind!

Penrose; Shadows of the Mind 1994

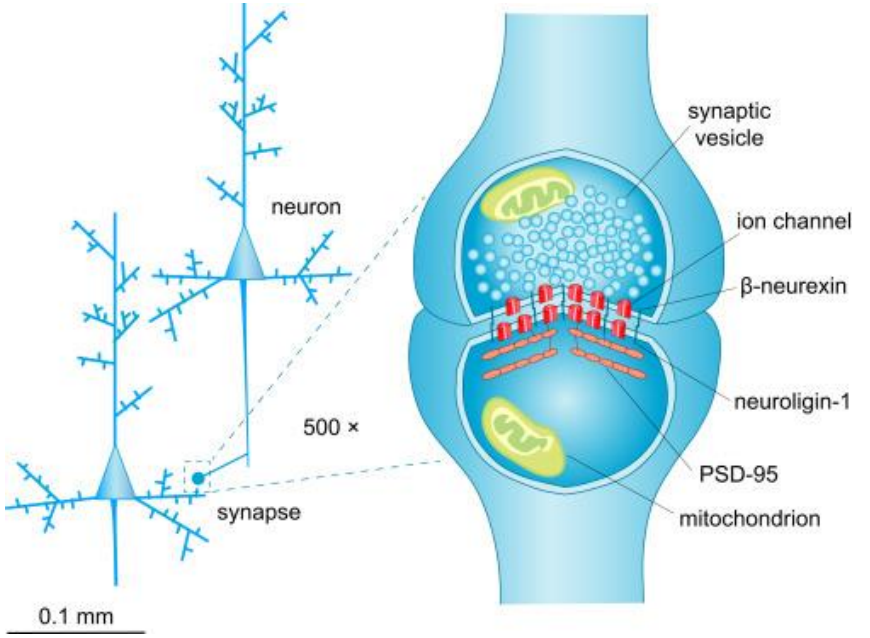
ID Henry Stapp (von Neumann, Wigner)

- QT sufficient to understand influences of consciousness on matter
- Intentional conscious acts intrinsically correlated with physical state reductions
- Actual occasions (both the physical act of state reduction and the correlated psychological intentional act) rather than matter or mind are fundamental elements of reality.
- Quantum randomness and free will
- Quantum Zeno effect – attention and intention
- Modulation of Born`s rule



ID Beck and Eccels

quantum mechanical processes, relevant for the description of exocytosis at the synaptic cleft, can be influenced by mental intention



IM Carl Friedrich v. Weizsäcker

That separate subjects with their objective content of consciousness are presupposed in the Cartesian split will, if we hypothetically apply quantum theory to human beings themselves, not prove to be the ultimate truth, but the classical approximation.

Subject-object dualism consists precisely in the approximation required for subjects to act and think objectively.

C. F. v. Weizsäcker in Yoga and the Evolution of Consciousness

Axioms of quantum physics by C. F. v. Weizsäcker

- Reality can be represented as mutually independent empirically decidable primal alternatives (Ure).
- For each such alternative there are states which, according to the laws of nature, attribute a certain probability to each of their possible results.
- The states assigned to an alternative, i.e. the probabilities defining them, change continuously in time.

IM Hans Primas: Quantum entanglement of physical and psychological time

- X is neutral with respect to the mind-matter distinction
- Symmetry breaking of a fundamental time-reversal symmetry of domain X
- Mental and material states disjoint as inequivalent representations of X
- Nonlocal correlations between them are remnants of the unbroken symmetry in X
- They decay as a function of time
- Mental and material states have different time arrows, forward and backward

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Lecture 3

Dialogic Quantum Approachs to Consciousness

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