

# **Jamesian Volition in Quantum Theory**

A Quantum Theory of the  
Effect of Conscious Effort  
upon Brain Activity

# How can our conscious thoughts affect our physical actions?

- Contemporary science divides our descriptions of the totality of all things into two categories: descriptions in physical terms; and descriptions in psychological terms.
- Physical properties consist of mathematically described properties localized at points or small regions of space-time.
- Psychological properties consist of “thoughts, ideas, and feelings”. They are collected into separate “streams of conscious experiences”, each associated with an individual human person.

# Causal Closure of the Physical in Classical Physics

- The *classical physical theories of the eighteenth and nineteenth centuries* entail the “causal closure of the physical”: a complete description of all physically described properties during one brief temporal interlude determines all of the physically described properties for all times.
- The psychologically described properties are therefore *causally redundant* with respect to the physical. They are causally superfluous.

# Wm. James on Consciousness

- “an organ, superadded to the other organs which maintain the animal in its struggle for existence; and the presumption of course is that it helps him in some way in this struggle, just as they do. But it cannot help him without being in some way efficacious and influencing the course of his bodily history.”

# Why quantum theory is needed.

- All the validated predictions of classical physics can be extracted from quantum theory, which is therefore more fundamental.
- The narrow widths of the “ion channels” entail that e.g. the calcium ions in the brain must *in principle* be treated quantum mechanically.
- Hence so *in principle* must the entire human brain.
- In quantum theory the conscious choices made by human beings affect physical properties.
- Hence using a classical-physics-type materialist conception of the brain to comprehend the interplay between mind and brain is not justified.

# Quantum theory has **two** causal gaps!

- Gap # 1
- Bohr: “In the great drama of life we are both **actors** and spectators.”
- Bohr and Heisenberg: “we are dealing with ‘free choices’ of the part of the experimenters.”
- Conscious choices made human agents determine the experimental conditions, which affect physical properties.
- Von Neumann calls these effects “Process 1 *interventions*”.
- Gap #2
- Dirac: “Nature’s choice of the *outcome* of the experiment.”

# Causation within contemporary theory

*Neither one of these two kinds of choices are fixed by the rules of quantum theory.*

- The *choices made by **nature*** conform to certain *statistical* rules.
- But the *choices made by **the experimenters*** are not constrained, within orthodox quantum theory, by any rules---statistical or otherwise.
- Yet these choices have physical effects

# A core problem in quantum theory: continuous theory; discrete experience!

- The quantum state of a physical system generally evolves into a continuous smear of possibilities of the kind that we can actually experience.
- Think, for example, of Schroedinger's cat, in a case where the half life of the radioactive source that triggers the release of the cyanide is a week. After a year in the closed box the state of the cat will be (mainly) a continuous smear of different states of decomposition.



# Another Example

- Consider a radioactive isotope placed in the center of a large sphere that is completely covered with an array of detectors.
- The wave function of the emitted positron is spread continuously over spherical surfaces, which spread continuously out from the source.
- Yet only one of the detectors fires!

# The problem of the partition of the “possibility space” into discrete parts.

- The array of detectors partition the continuous space of possibilities into a discrete (countable) set of experientiable parts.
- But what determines (specifies) this partition into discrete parts?
- *In actual experimental practice* it is the experimenter’s “free choice” of how he or she will set up the experiment.
- More generally, it is von Neumann’s Process 1 *intervention* that accomplishes the partition of the continuous space of possibilities into a set discrete experientiable parts.

# “Interventions” are needed!

- No one has figured out how the *continuous* quantum state of the universe could, by itself, specify its own partitioning into *discrete* experiencable parts.
- This is **The Logical Problem** that leads to the introduction of *interventions from the psychologically described domain*.
- These *interventions* open the way to the possibility of the *physical efficacy of our conscious thoughts*.

**An Intrinsically Discrete Aspect:  
Experience comes in “drops”;  
it comes in indivisible/atomic units!**

- William James: “Either your experience is of no content, of no change, or it is of a perceptible amount of content or change. Your acquaintance with reality grows literally by buds or drops of perception. Intellectually and on reflection you can divide them into components, but as immediately given they come totally or not at all.” (PoP, Vol 1, p. 68)

# Psychophysical Interventions!

- In orthodox quantum mechanics the interventions are psychophysical events.
- Each such event is a “Drop of Experience”, which constitutes new knowledge, *coupled with a physical event* that reduces the prior physical state to the *part* of that state that is compatible with the new knowledge.

# The nature of the quantum state

- Heisenberg: “The probability function combines objective and subjective elements. It contains statements about possibilities or better *tendencies* (“*potentia*” in Aristotelian philosophy) and these are completely objective,...and it contains statements about *our knowledge* of the system, which of course are subjective in so far as they may be different for different observers.”  
(P&P,p.53)

# The Ontological Structure of Quantum Theory

Each physical state represents *potentialities for future drops of experience to occur*

Each occurrence of a “drop of experience” is accompanied by a **reduction** of the “prior physical state of the system being probed” to the part of that state that is compatible with the newly gained knowledge.

This sudden reduction of the physical state alters the **potentialities** pertaining to the next discrete “drop of experience”, and so on.

# Copenhagen → von Neumann

- In the original (Copenhagen) formulation of quantum theory the system being probed, which is the system described in the mathematical language of QM, consists of *a small part of the universe*.
- The rest of the universe, including the bodies and brains of the conscious agents and their measuring devices, are described in terms of our experiences about them.



# von Neumann's extension

- Von Neumann expanded this *physically described* (i.e., *mathematically described*) system to include the entire physical universe, including, in particular, the bodies and brains of the experiencing human agents.
- Formerly, the *extended observer*, which included his measuring devices, acted upon the aspects of the quantum system that was being directly probed.
- In the vN formulation, each “drop of experience” is able to influence the associated brain.

# “Thought is Itself the Thinker” (William James)

- *If the passing thought be the directly verifiable existent, which no school has hitherto doubted it to be, then that thought is itself the thinker, and psychology need not look beyond. (PoP, Vol 1, p.401)*
- The “actualities” are the “drops of experience” themselves, not the conscious thinkers that know them,
- Your awareness of your “self” must be an **aspect of your thoughts**: there is **no need to assume**, additionally, a persisting conscious “self” standing behind your thoughts. (*A Spartan ontology---Occam*)
- Your stream of consciousness consists of “ideas clinging together”.
- The question is: “whence do they get their fantastic laws of clinging?” (Vol 1, p.3)

# “Templates for Action”

- The experimenter’s “free choice” to probe nature in some particular way leads to a conscious intent to act in a way that will bring this conceived state of affairs into being.
- The neural correlate of this conscious intent is a pattern of neurological activity that if maintained for a sufficiently long period will cause the intended bodily action to occur.
- I call this pattern a “*template for action*”.

# The action of the template.

- A “template for action” will , *if it persist for a sufficiently long period*, send out the sequence of neural pulses that will cause the intended bodily (or brain) action to actually occur.

# An Example of the Effect of Conscious Intent/Effort on Neural/Brain Activities

- Suppose the idea “I shall now raise my arm” occurs in a stream of consciousness, and this idea is colored by a strong feeling of the positive value of that contemplated action.
- Suppose this valuation tends to produce a successor idea in which the core idea “I shall now raise my arm” is colored with a feeling of “I am making an effort to raise my arm now”.

# Example Continued:

## Entry of the quantum Zeno effect.

- Postulate that the **felt effort** causes, by virtue of the “fantastic laws of clinging” an immediate (within a few milliseconds) repetition of that experience, and that this experience causes another immediate repetition, and so on.
- This rapid sequence of actualizations of the associated “template for action” will tend---by virtue of a quantum effect called the *quantum Zeno effect*---to hold that template for action in place for longer than would otherwise be the case.

# Example Continued

- This *persisting excitation of the template for action* will then tend to cause your arm to rise.
- This constitutes an effect of mind upon matter.
- The entire causal process proceeds in strict accord with the orthodox principles of physics: a certain *causal gap* in that theory has merely been filled in an allowable way.
- The quantum Zeno effect is itself a decoherence effect, and it is not diminished by environmental decoherence. It evades the usual argument against the possibility of an intrusion of the *quantum-observer effects* into brain dynamics.

# Benefits of this Quantum Approach

- Actual scientific practice involves three components: (1), our freedom to act upon the world in ways of our choosing; (2), the experienced feedbacks from these actions; and (3), a mathematical framework used to explain the correlations between the first two aspects.
- The proposed quantum ontology treats these three components in accordance with the way they are used in actual practice, rather than by forcing, unnaturally, a conceptualization that conforms with *materialist notions* carried over from the *known-to-be-fundamentally-false precepts of classical physics*.



# Benefits Continued

- To do science a scientist needs an ontology. He or she needs an understanding of himself or herself doing science. It is not enough to have simply a set of rules for computing expectations pertaining to outcomes of experiments without any comprehension of the possibility of himself or herself setting up and performing the experiments that he or she considers to be pertinent.

# Benefits, continued

- The most useful ontology is one that is compatible **both** with the laws of physics as they are currently understood and applied, **and** with one's intuitive understanding of oneself as a conscious agent able to select on the basis of rational reasons and intuitive insights which course of action he or she will pursue, and then to implement that decision by intentional/effortful action.
- The view of human beings as causally equivalent to biological automata, deluded by the illusion that one's thoughts and efforts can make a difference in one's behavior, is neither entailed by science nor conducive to the progress of science.

# Wm. James on Volition

- “I have spoken as if our attention were wholly determined by neural conditions. I believe the array of things we can attend to is so determined. No object can catch our attention except by the neural machinery. But the amount of attention which an object receives after it has caught our attention is another question. It often takes effort to keep mind upon it. We feel we can make more or less of the effort as we choose.

# James on Volition, continued

- If this feeling be not deceptive, if our effort be a spiritual force, and an indeterminate one, then of course it contributes coequally with the cerebral conditions to the result. Though it introduce no new idea, it will prolong the stay in consciousness of innumerable ideas which else would fade more quickly away. (BrieferCourse, p.227)
- The essential achievement of the will, in short, when it is most “voluntary”, is to attend to a difficult object and hold it fast before the mind. (ibid. p.417)

# Intuition

The *intuitive* quantum ontology is more useful than the *counterintuitive* classical physics ontology.