A quantum theory of dreams?

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Roger Highfield explains an intriguing new insight into the workings of the brain

A physicist claims to have come up with the first successful use of quantum theory to explain features of consciousness in research hailed as a landmark in efforts to bring mathematics to bear on the mysteries of the human mind.

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Quantum mechanics is the most successful scientific theory of all time in explaining events at the subatomic level.

Now this theory holds out the tantalising prospect of shedding light on some of the greatest puzzles in biology: the nature of consciousness, the perception of time, even dreams.

The use of quantum mechanics this way has been controversial for two reasons: first, this highly mathematical theory is routinely abused by charlatans attempting to explain spooky paranormal phenomena; and, second, scientists cannot even agree on a definition of consciousness, undermining any quest to explain it.

But an intriguing way to bridge the gap between reality and theory has now been put forward by Prof Efstratios Manousakis of Florida State University, Tallahassee, in a paper published online, entitled "Quantum theory, consciousness and temporal perception: Binocular rivalry."

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He has used a concept he calls "potential consciousness" to explain a well known visual illusions, the "image flips" the brain makes when faced with ambiguous information simultaneously. The particular example he studied is "binocular rivalry," when the brain is presented with different images at each eye.

More familiar examples include "gestalt" images that can look like either a vase or two faces, as here, but not both at the same time and the Necker cube, where a line drawing does image flips because the drawing of the cube can appear to go into the screen, or pop out of it.

There has long been a feeling that by understanding how the brain switches between these versions scientists may shed light on how the conscious experience is generated.

Prof Manousakis has now laid out a theory of how a quantum effect could influence image flips in binocular rivalry studies and then, as good science demands, made some predictions.

His predictions are based on the rate that nerve cells fired in the brain. It turns out that the hallucinogenic drug LSD can slow the firing rate of brain cells and, when he factored this effect into his quantum model, he predicted the flip rates would change too.

This is precisely what subjects who took LSD reported in experiments conducted by another group. "My theory simply explains their findings in a simple way," he told The Daily Telegraph.

Prof Manousakis has now made more predictions that can be tested, based on what happens when subjects glance at the cube from time to time.

This, he believes, could shed light on how our awareness of the passage of time changes, depending on how busy we are, since his theory suggests that when a stimulus such as vision freezes, the perceived time slows to a standstill.

The fact that his idea is testable distinguishes his idea from one of the most famous quantum theories of consciousness suggested a decade ago by mathematician Sir Roger Penrose at the University of Oxford and Stuart Hameroff, an anaesthesiologist at the University of Arizona, Tucson, the latter arguing in New Scientist that dreams resemble quantum information with their "multiple coexisting possibilities, timelessness, hidden meaning and bizarre logic" (an interpretation that Prof Manousakis himself is not prepared to make).

The peers of Prof Manousakis are impressed with this study, given that this application of quantum mechanics has been mired in controversy.

New Scientist was told by Franco Nori of the University of Michigan, Ann Arbor, and RIKEN's Research Institute, Japan, that the "logic is impeccable." And Henry Stapp of Lawrence Berkeley National Laboratory, California, said that, if correct, "this is a landmark paper."

However, as is always the case when extraordinary claims are made, there are sceptics. Hugh Wilson of York University, Ontario, Canada, told the journal that the brain is a macroscopic object, not a microscopic one where quantum theory rules, and quantum processes are not significant.