Biosketch – Stuart Hameroff

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Stuart Hameroff MD is Emeritus Professor of Anesthesiology & Psychology, Director of the Center for Consciousness Studies, and attending anesthesiologist at Banner-University Medical Centers, all at the University of Arizona in Tucson.

Hameroff grew up in Cleveland, Ohio, and attended the University of Pittsburgh, studying chemistry, physics, mathematics and philosophy of mind.  At Hahnemann Medical College in

Philadelphia in the early 1970s, he spent time in a cancer research lab studying cell division/mitosis, becoming interested in how mitotic spindles, composed of cylindrical protein lattice polymers called microtubules, were able to very precisely separate and move chromosomes in a delicate dance. Comparing the microtubule lattice to Boolean computer matrices, Hameroff began to develop an idea that microtubules were computer-like sources of biological intelligence, and possibly consciousness.

After medical school, Hameroff trained in the department of anesthesiology at the University of Arizona Medical Center in Tucson. He was recruited and mentored by the department’s

founding chair Burnell Brown Jr, MD, PhD, who told him that understanding how anesthesia works was the key to understanding consciousness. And he handed him a paper showing anesthetics affected microtubules. Hameroff began residency in the department of anesthesiology in 1975, and joined the faculty in 1977, a position he still holds as emeritus professor and practicing anesthesiologist at (now) Banner-University Medical Centers.

Over his 47 years in the department Hameroff has pursued research in chronic pain, high frequency ventilation and transcranial ultrasound (TUS) as a clinical tool addressing microtubule resonances to treat mental and cognitive disorders. But his main interest has been related to microtubules, anesthesia and consciousness.

In the 1980s Hameroff collaborated with physicists to develop models of information processing in microtubules based on ‘cellular automata’ (‘microtubule automata’) able to interact with membrane and synaptic activities.  Applied to microtubules in brain neurons, the

approach theoretically increased brain information processing capacity enormously. But it didn’t begin to explain the nature, or origin of consciousness.

In 2001 Hameroff read ‘The emperor’s new mind’ by Roger Penrose which proposed that

consciousness stemmed from collapse (quantum state reduction) of the quantum wavefunction

due to an objective threshold related to gravity (objective reduction, ‘OR’), and that

the brain must contain some form of quantum computer

which would organize or orchestrate these OR quantum events.

Hameroff suggested to Penrose that microtubules inside brain neurons might be the biological quantum computers he was looking for. Penrose agreed, and the two teamed up to develop the ‘Orchestrated objective reduction’, ‘Orch OR’ theory of consciousness which connects brain activity to quantum state reductions at the most basic level of the universe - fundamental spacetime geometry – where Penrose had proposed Platonic information could influence conscious choices and perceptions.

Orch OR has been viewed skeptically by scientists and philosophers because technological quantum computers require extremely cold temperatures to avoid thermal “decoherence”, and the brain is a warm 37.6 degrees Centigrade. But recent experiments which are part of the Templeton World Charity Foundation (TWCF) program “Accelerating Research in Consciousness” have demonstrated quantum effects in microtubules at ambient temperatures. Experiments in Greg Scholes’ lab at Princeton, and in Aristide Dogariu’s lab at Central Florida show that quantum optical effects in microtubules are dampened by anesthetics which selectively block consciousness.  The Open Science Foundation (‘OSF’) registration for the project is here <https://osf.io/zqnjd/>, and the first paper submitted to a top journal and is posted here on the BioArXiV <https://arxiv.org/abs/2208.10628>

In 1994, with University of Arizona colleagues Al Kaszniak in Psychology, Alwyn Scott in Mathematics, Jim Laukes in Extended University, and subsequently David Chalmers in Philosophy, Hameroff started an interdisciplinary, international conference series ‘The Science of Consciousness’ (‘TSC’).  Held in even-numbered years in Tucson, and odd-numbered years elsewhere around the world, the 29th annual TSC was held in April 2022 in Tucson. The 2023 conference will be held in Taormina, Sicily co-organized with Riccardo Manzotti and colleagues.

In 1998, with Kaszniak and Scott, and a 1.4-million-dollar grant from the Fetzer Institute,

Hameroff co-founded the University of Arizona Center for Consciousness Studies (CCS), served as associate director, and succeeded Kaszniak and then Chalmers, as director in 2004. With Abi Behar-Montefiore as assistant director and conference manager, CCS has subsisted since 2004 and in 2018 moved administratively to the College of Social and Behavioral Sciences. University of Arizona Regents  Professor Tom Bever has acted as CCS Co-Director and, with support from the Eugene Jhong Family Foundation, has developed an educational curriculum for which Hameroff will teach a course ‘Introduction to the science of consciousness’ as he transitions from clinical work to research and education. CCS Associate Directors include psychologist Jay Sanguinetti, an authority in non-invasive brain modulation including transcranial ultrasound, and another Regents professor, planetary scientist Dante Lauretta who studies astrobiology and the origin of life and consciousness. Abi Behar-Montefiore continues as CCS stalwart Assistant Director and conference manager.

Hameroff has written or edited 6 books, and several hundred scientific articles and book chapters, lectured on 6 continents, appeared in the film ‘WhattheBleep?’ and numerous TV shows about consciousness on BBC, PBS, Discovery, OWN, National Geographic, and History Channel.