JAV profesoriaus **Stuart Hameroff** paskaita

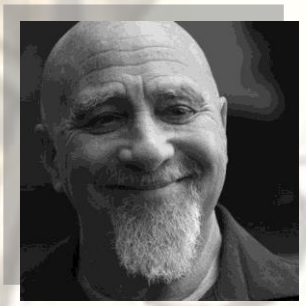
„Kvantiniai virpesiai smegenyse – ar galima ultragarsu per kaukolę gydyti psichinius ir sąmonės pažinimo sutrikimus?“

Paskaita vyks birželio 17 d. VU Chemijos fakultete (Naugarduko g. 24), Fizikines chemijos auditorijoje nuo 10.00 val. Diskusijos galimos iki 13 val. Paskaita vyks anglų kalba.

Pranešimo tezės

Quantum brain vibrations – Can transcranial ultrasound ('TUS') treat mental and cognitive disorders?

Stuart Hameroff



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Brain functions leading to cognition and conscious mental states depend to some extent on cytoskeletal structures inside brain neurons called microtubules, cylindrical polymers of the protein tubulin. Evidence in recent years has shown microtubules resonate coherently in kilohertz, megahertz and gigahertz frequencies, apparently driven by faster terahertz vibrations among pi resonance clouds of aromatic amino acids (e.g. tryptophan) within tubulin. These microtubule vibrations appear to be quantum resonances occurring in non-polar, hydrophobic 'quantum channels' mediated by electronic excitation transitions described through (1) HOMO/LUMO interactions, (2) van der Waals London force dipole couplings, (3) resonance transfer, (4) excitons, and/or (5) tunneling, similar to interactions shown, or proposed in photosynthesis proteins, quantum criticality (Kauffman) and lipid micelles (Tamulis). Quantum channels are defined by the 'Meyer-Overton correlation', hydrophobic, non-polar solubility regions where anesthetics act to specifically erase consciousness by quantum dipole dispersion forces. A hierarchy of intra-neuronal frequencies (terahertz, gigahertz, megahertz, kilohertz) in microtubules may lead to brain EEG rhythms (hertz). Thus mental states and cognitive functions are likely to depend in some way on microtubule vibrations, e.g. in megahertz, whose modulation could alter and possibly improve brain function. Non-invasive brain modulation techniques (TMS, tDCS, tACS) include transcranial ultrasound (TUS), mechanical vibrations typically 0.5 to 8 megahertz, used safely in medicine for nearly a century. Our group published the first human TUS study in 2013, showing mood enhancement, and subsequently have shown that TUS for 15 or 30 seconds at 150 mW/cm^2 to right fronto-temporal scalp and cortex results in 30 to 40 minutes of mood enhancement. Recently, studies in animal models of Alzheimer's disease (in which microtubules de-stabilize) have shown TUS-induced improvement in symptoms and pathology. With a new TUS device, the 'NeuroResonator' (Berkeley Ultrasound) we plan clinical studies of TUS for depression, Alzheimer's, traumatic brain injury and other disorders.