Stuart R. Hameroff, MD **Curriculum Vitae (May 6, 2021)**

Position title
Emeritus Professor, Anesthesiology
Emeritus Professor, Psychology
Director, Co-Founder, Center for Consciousness Studies
Attending Anesthesiologist, Banner-University Medical Center
University of Arizona, Tucson, Arizona

Education/Training

Institution and Location	Degree	Years	Field of Study
University of Pittsburgh Pittsburgh, PA	B.S.	1965-69	Chemistry, Physics Mathematics
Hahnemann Medical College Philadelphia, PA	M.D.	1969-73	Medicine
Internship, Tucson Medical Center Tucson, AZ		1973-74	Integrated
Residency in Anesthesiology University of Arizona Medical Center-Banner Tucson, AZ		1975-77	Anesthesiology

Employment

1977-present Attending Physician/Anesthesiologist, Department of Anesthesiology, University Hospital, University Medical Center, University Physicians Inc., University of Arizona, Health Sciences Center, UAHN, Banner-University Medical Center, The University of Arizona, Tucson, Arizona
1977-1978 Instructor, Anesthesiology, University of Arizona, College of Medicine, Tucson, Arizona
1978-1984 Assistant Professor, Anesthesiology
1979 Certified by the American Board of Anesthesiology
1979-1985 Director, Pain Clinic/Pain Service, University Medical Center
1984 -1995 Associate Professor with Tenure, Anesthesiology
1994 Joint Appointment, Associate Professor, Department of Psychology
1995 Professor, Department of Anesthesiology, College of Medicine
1995 Professor, Department of Psychology, University of Arizona
1999 Co-Founder, Associate Director, Center for Consciousness Studies, The University of Arizona
2003-present Emeritus Professor, Anesthesiology and Psychology, The University of Arizona
2004-present Director, Center for Consciousness Studies, The University of Arizona

Biosketch

Stuart Hameroff MD is Emeritus Professor of Anesthesiology & Psychology, Director of the Center for Consciousness Studies at the University of Arizona and attending anesthesiologist at the Banner-University Medical Center in Tucson, Arizona. In the 1970s, Hameroff became interested in intelligent activities of microtubules, protein lattices which organize living cell interiors, and in the 1990s teamed with British physicist and 2020 Nobel prize winner Sir Roger Penrose on the 'Orch OR' theory of consciousness. Based on quantum computing in brain neuronal microtubules, Orch OR 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 most 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

Orch OR has been bolstered by evidence showing functional quantum states in photosynthesis proteins in warm sunlight and quantum vibrations in microtubules at ambient temperatures. Computer modeling suggests anesthesia acts by selective dampening of microtubule quantum vibrations, erasing consciousness. As part of the Templeton World Charity Foundation (TWCF) program "Accelerating Research in Consciousness", Hameroff and colleagues have designed and are performing definitive experiments to look for quantum vibrations in microtubules, and test effects upon them of anesthetic gases (http://osf.io/zqnjd/). Orch OR may be either falsified or validated within the next few years.

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 70s, he spent time in a cancer research lab studying cell division/mitosis, becoming interested in how mitotic spindles, composed of microtubules, precisely separated chromosomes in a delicate dance. Comparing their lattice structure to computer matrices, he developed an idea that microtubules were computer-like sources of biological intelligence, and perhaps consciousness. Hameroff trained in the department of anesthesiology at the University of Arizona Medical Center in Tucson, mentored by the founding chair Burnell Brown Jr, MD, PhD. After residency, Hameroff joined the anesthesiology faculty in 1977, a position he still holds as emeritus professor and practicing anesthesiologist. In addition to microtubule information processing, consciousness and anesthetic action, he 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.

In 1994, with University of Arizona colleagues Al Kaszniak in Psychology, Alwyn Scott in Mathematics, 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 27th annual TSC was held (Online due to pandemic) in September 2020. 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, CCS has subsisted since 2004 on conference fees and small grants and has supported relevant research. In 2018 CCS moved administratively to the College of Social and Behavioral Sciences under Dean JP Jones. The 2021 conference (August 3-6) will celebrate the science of Sir Roger Penrose on the occasions of his 90th birthday and Nobel prize. The 2022 Science of Consciousness Conference is planned for Tucson, AZ (April 18-23).

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 and media shows about consciousness on BBC, PBS, Discovery, OWN, RT and History Channel.

Books Authored or Edited

Hameroff SR, Kaszniak AW & Chalmers D. (Eds.) **(1999).** *Toward a Science of Consciousness III: The Third Tucson Discussions and Debates.* Cambridge, MA: MIT Press/Bradford Books.

Hameroff SR, Kaszniak AW & Scott AC. (Eds.) **(1998).** *Toward a Science of Consciousness II: The Second Tucson Discussions and Debates*. Cambridge, MA: MIT Press/Bradford Books.

Hameroff SR, Kaszniak AW & Scott AC. (Eds.) (**1996).** *Toward a Science of Consciousness: The First Tucson Discussions and Debates*. Cambridge, MA: MIT Press/Bradford Books.

Koruga DL, Hameroff SR, Withers J, Loutfy R, & Sundareshan M. (Eds.) **(1993).** *Fullerene C60 – History, Physics, Nanobiology, Nanotechnology.* Amsterdam: Elsevier-North Holland, Amsterdam - Elsevier Science Ltd; First Edition (May 1, 1993) ISBN-13: 978-0444898333. ISBN-10: 0444898336

Hameroff SR. **(1987).** *Ultimate Computing: Biomolecular Consciousness and NanoTechnology*. Amsterdam: Elsevier-North Holland. eBook: 978-0-444-60009-7

Peer-Reviewed Articles

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Hameroff S. **(2020)** "Orch OR" is the most complete, and most easily falsifiable theory of consciousness *Cognitive Neuroscience* DOI: 10.1080/17588928.2020.1839037

Sanguinetti JL, Hameroff S, Smith EEE, Sato T, Daft CMW, Tyler WJ, Allen JJB. **(2020)** Transcranial focused ultrasound to the right prefrontal cortex improves mood and alters functional connectivity in humans *Frontiers in Human Neuroscience* 14:52
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Hameroff, Stuart. **(2019)** Consciousness and quantum state reduction – Which comes first? *Activitas Nervosa Superior,* April 2019. 61:31-40. link

Hameroff, SR. **(2018)** Editorial. "Anesthetic action and 'quantum consciousness': A match made in olive oil." *Anesthesiology* 8(129):228-231. link

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Craddock, J.A. Travis, Friesen D, Mane J, Hameroff SR, and Tuszynski JA. **(2014)** "The Feasibility of Coherent Energy Transfer in Microtubules." *Journal of the Royal Society Interface*. Nov 6; 11(100). link

Hameroff, SR, Craddock TJ, Tuszynski JA **(2014)** "Quantum effects in the understanding of consciousness." *J Integr Neurosci.* 13(2):229-52 link

Hameroff, S. (**2014**, Aug 12). Comment. L Turin et al, Proc. Nat. Acad. Sci.*,* "Electron spin changes during general anesthesia in Drosophila." *Chemistry World Review*. August 11. link

Hameroff, S. Commentary on Stuart Kauffman's *Quantum Criticality at the Origins of Life,* **(2015).** In: John Hewitt's "Quantum Criticality in Life's Proteins" (update), *Phys.org.* link

Hameroff, S., and Penrose R. **(2014)** "Consciousness in the universe: A review of the 'Orch OR' theory." *Phys Life Rev*, Mar 11(1):39-78. Sci Direct Elsevier

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Hameroff S., Penrose R. **(2014)** “Reply to Criticism of the 'Orch OR qubit' - Orchestrated objective reduction is scientifically justified.” *Physics of Life Reviews*, 11(1):104-112. link

Hameroff S. (2014). “Consciousness, Microtubules and ‘Orch-OR’: A ‘Space-time’ Odyssey.” **(2014)** *Journal of Consciousness Studies*, Imprint Academic. Vol. and 21, 3-4, pp 126-153. link

Hameroff S. **(2014)** “Quantum walks in brain microtubules-a biomolecular basis for quantum cognition?” *Top Cogn Sci*, Jan; 6(1):91-7. link

Hameroff, SR. **(2013)** Quantum mathematical cognition requires quantum brain biology: the "Orch OR" theory. *Behav Brain Sci*, June; 36(3):287-90. link

Hameroff, S. **(2013)** Comment on: A Tale of Two Fields: “Dissipation of ‘dark energy’ by cortex in knowledge retrieval” by Capolupo, Freeman and Vitiello. *Phys Life Rev*. March; 10(1):95-6; discussion 112-6. link

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Hameroff, Stuart. **(2007)** “The Good, the Bad and the Octopus.” *Journal of Consciousness Studies,* Volume 14, Number 8, 2007, pp. 105-109(5). pdf

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Book Chapters and Proceedings

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Hameroff, SR, Vernetta LA, Lee YC, Sarid D, Watt RC, **(1990)** Atomic Resolution of Cytoskeletal Protein by Scanning Tunneling Microscopy, *Proceedings of the Twelfth Annual International Conference of the IEEE,* 1-4 Nov. 1990; 1724-1724. link

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Hameroff, S., Karampurwala, H., & Rasmussen, S., (Eds.), **(1990)** June; 17-21; 3:715-720). "Adaptive behavior in sub-neural microtubule automata." IJCNN International Joint Conference on Neural Networks, IEEE Publisher.

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Rasmussen S, Karampurwala H, Vaidyanath R, Hameroff S. **(1989)** Emergent computation in microtubule model networks. Engineering in Medicine and Biology Society. Images of the Twenty-First Century. *Proceedings of the Annual International Conference of the IEEE Engineering* in 9-12 Nov 1989. 4:1368-1369. link

Watt RC, Ehlers KC, Scipione PJ, Maslana ES, Hameroff SR. **(1989)** Dimensional analysis of the electroencephalogram during general anesthesia. Engineering in Medicine and Biology Society, 1989. Images of the Twenty-First Century. *Proceedings of the Annual International Conference of the IEEE Engineering*. 9-12 Nov 1989; 6:1881-1882. link

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Grants/Awards

2021 Submitted: Testing for consciousness in cerebral organoids (with Alysson Muotri, through UCSD) $5 million/5years
2021 Alvin J. Clark Foundation for Science & Roger Penrose conference
2021 Mani Bhaumik for Science & Roger Penrose conference
2021 Eugene Zhong Family Foundation - CCS Educational grant (Tom Bever) $75,000
2020 Templeton World Charity Foundation – Experiments to test Orch OR theory (through University of Alberta) $230,000
2020 Fetzer Institute – The Science of Consciousness Online conference $50,000
2020 Templeton World Charity Foundation – Testing Orch OR Quantum Theory of Consciousness – conference 40,000
2020 Fetzer Institute – Testing Orch OR Theory of Consciousness $18,500
2020 Vielight – The Science of Consciousness Online conference $5,000
2020 Crowdfundng (Jay Sanguinetti) Transcranial ultrasound $68,000
2020 Alvin J. Clark Foundation – The Science of Consciousness Online Conference $10,550
2020 Eugene Zhong Family Foundation - CCS Educational grant (Tom Bever) $45,000
2020 Dennis Balson – TSC Conference $3,000
2020 Facilitating mindfulness training - TUS– with Jay Sanguinetti, Shinzen Young, J Allen, Stuart Hameroff $68,000 – crowdfunding

2020 Sonication enhanced mindfulness acquisition, Atlantic Foundation, with Jay Sanguinetti, S. Young $50,000
2019 Anonymous – TSC 2020 Conference $10,000
2019 Default mode network ultrasonic neuromodulation, Atlantic Foundation with J. Sanguinetti, JA Allen $150,000
2019 Interlaken TSC Sponsors Alvin Clark and Mani Bhaumik $20,000
2018 Penrose Institute – Treating mental and cognitive disorders with Transcranial Ultrasound (TUS), Penrose Foundation, CCS, S. Hameroff and J. Sanguinetti $150,000
2018 Univ. of Michigan CCS (George Mashour) – TSC Conference - $45,000
2018 Ron Gruber – TSC Conference - $500
2018 Alvin J. Clark Foundation – TSC Conference - $10,000
2018 Dennis Balson – TSC Conference $1500
2017 Mani Bhaumik – TSC Conference $10,000
2017 Alvin Clark – TSC Conference $10,000
2016 Center for Consciousness Science, U Michigan –TSC Conference Co-Sponsor $40,000
2016 Alvin J. Clark Foundation – TSC Conference - $10,000
2016 Dennis Balson – TSC Conference $1000
2016 Ron Gruber - TSC-Conference $500
2016 YeTaDel Foundation – TSC Conference $1000
2016 Mani Bhaumik – TSC Conference $10,000
2014 Mani Bhaumik - Toward a Science of Consciousness TSC-20th Anniversary Conference Penrose Prize $10,000
2014 YeTaDel Foundation – TSC Conference $2500
2013-4 Transcranial ultrasound for mood enhancement, Thync/Neurotrek, with JA Allen, J. Sanguinetti, Hameroff $89,998
2012 Monroe Institute – TSC Conference $5000
2012 David Benjamin Publishing– TSC Conference $1000
2011 Elata Inc – TSC Conference – $1000
2011 Chapman University – TSC Conference $2000
2011 Rustum Roy Award, Chopra Foundation $75,000
2011 Institute of Noetic Sciences, TUS Pilot Study $5,000
2011 USAF-AFOSR - 2011 TSC-Stockholm Conference, European Office; Asian Office of Aerospace R&D $23,000
2009 Anonymous – TSC Conference $10,000
2009 Neti Neti – TSC Conference $10,000
2007 YeTaDeL Foundation Award for Quantum Approaches to Consciousness – TSC Conference $13,5000
2003 Samueli Foundation Award for 2003 Quantum Mind conference $20,000
1998-2001 Fetzer Institute Award to establish the Center for Consciousness Studies at the University of Arizona $1.4 million
1990-9 National Science Foundation (NSF) Nonlinear dynamics: Solitons in biomolecules (Co-PI Alwyn Scott) $40,000
1982 Pfizer-Roerig Pharmaceuticals: Effects of the antidepressant doxepin in chronic pain $30,000
1996-2014 Woodward White Independent Survey, US Pacific Region, Best Doctors in America, *(Neuroanesthesia)*

Online Presentations
Short list

Penrose, Sir Roger and Hameroff, Stuart. Presentation. *Consciousness and the Physics of the Brain*. **The Qualcomm Institute.** Sanford Consortium for Regenerative Medicine - Roth Auditorium - La Jolla, CA. **January 10, 2020.** https://www.youtube.com/watch?v=xGbgDf4HCHU

Hameroff, S. Presentation. *Anesthesia, Consciousness, Bohm and Penrose* (EmQM17), **University of London, UK** – posted Oct 2020 - Emergent Quantum Mechanics **October 26-28, 2017** –Towards Ontology of Quantum Mechanics and the Conscious Agent, David Bohm Centennial Symposium, 4th International Symposium on Quantum Mechanics based on a "Deeper Level Theory", Sponsored by Fetzer Franklin Fund.
https://www.youtube.com/watch?v=xGbgDf4HCHU
https://emqm17.org/presentations/Stuart-Hameroff/

Hameroff, S. Presentation. *Is Your Brain Really a Computer?* **Sand Conference**, **2019.**
https://www.youtube.com/watch?v=mrdkNeXUfGg
Hameroff, S. The Science of Consciousness. Presentation. Sand Conference 2019.
https://www.youtube.com/watch?v=JHg-mr4aqWk&t=162s

Hameroff, S. *What is Consciousness?* Interview by Robert Lawrence Kuhn. **Closer to Truth, PBS April, 2014**. https://www.youtube.com/watch?v=UhAVbX3K5Q4

Hameroff, S. Presentation. *The Future of Consciousness.* **TEDx Tucson. December 2012.**
https://www.youtube.com/watch?v=1d5RetvkkuQ

Hameroff, S. How quantum brain biology can save the world TEDx Brussels **2010**
https://www.youtube.com/watch?v=ilyEjh6ef_8

Hameroff, S. *How Do Human Brains Function?* Interview by Robert Lawrence Kuhn. **Closer to Truth, PBS. April, 2014.** https://www.youtube.com/watch?v=cJtYElOI75k

Hameroff, S *Anesthetic action links consciousness to quantum vibrations*. **CalTech. June 11, 2018.**
https://www.youtube.com/watch?v=VG8_hInFdWM

Hameroff, S. *Physics of free will.* Interview by Robert Lawrence Kuhn. **Closer to Truth, PBS. April 2014.** https://www.youtube.com/watch?v=ztGNznIowic

Hameroff, S. *Quantum Consciousness.* Interview with Robert Wright. **The Wright Show.** Meaning of Life.tv. **June, 2018** https://www.youtube.com/watch/Rnx4vf9eeWE

Hameroff, S. *Consciousness is more than computation.* Interview with Nikola Danaylov. **September, 2013. Singularity Weblog.** https://www.youtube.com/watch?v=YpUVot-4GPM

Hameroff, S. *Microtubules and quantum consciousness.* **GF 2045 Initiative. Global Future 2nd International Congress. June, 2013. Alice Tully Hall. Lincoln Center**.
https://www.youtube.com/watch?v=R5DqX9vDcOM
https://phys.org/news/2013-08-world-itskov-futurists-convene-gf2045_1.html

Hameroff, S. *What is a theory of consciousness for?* **Sand Conference, 2018.**
https://www.youtube.com/watch?v=h89zweg_AuE

Hameroff, S. *A Brief History of the Study of Consciousness.* **Sand Conference 2015.** https://www.youtube.com/watch/hKAVgq99o_w

Additional Links:

- http://en.wikipedia.org/wiki/Stuart_Hameroff
- www.quantumconsciousness.org
- www.consciousness.arizona.edu
- YouTube - The Science of Consciousness - TSC Conferences - Videos

Hameroff, S **(2019).** The Microtubule Quantum Vibration Theory of Anesthetic Action, Invited update to Wikipedia page 'Theories of General Anesthetic Action'

Reviewer

Journal of Integrative Neuroscience
Medical Hypothesis
Anesthesiology
Anesthesia and Analgesia
Physica A
Medical Hypotheses
Bioessays
Trends in Cognitive Sciences ('TICS')
Journal of Consciousness Studies
Progress in Biophysics and Molecular Biology
Bio-Algorithms and Med-Systems
Proceedings A Royal Society

Editorial Boards

BioSystems; Journal of Consciousness Studies (Assoc. Editor)

Professional Memberships

American Society of
Anesthesiologists
Association of University
Anesthesiologists
Society for Neuroscience
Association for the Scientific Study of
Consciousness

Conferences organized/Co-organized

1991 NATO Advanced Workshop: Coherence in Bioenergetic Systems - Tucson, Arizona
1994 Toward a Science of Consciousness ("TSC 1") Apr 12-17 - Tucson, Arizona
1995 Toward a Science of Consciousness ("TSC 2") - Naples, Ischia, Italy (Chloe Taddei-Ferretti)
1996 Toward a Science of Consciousness ("TSC 3") Apr 8-13 - Tucson, Arizona

1997 Toward a Science of Consciousness ("TSC 4") Aug 18-24 - Elsinore, Denmark (Alwyn Scott)
1998 Toward a Science of Consciousness ("TSC 5") Apr 27- May 2 - Tucson, Arizona
1999 Toward a Science of Consciousness ("TSC 6") May 28 - Tokyo, Japan (Kunio Yasue, Mari Jibu)
1999 Quantum Mind 1 August - Flagstaff AZ
2000 Toward a Science of Consciousness ("TSC 7") Apr 10-15 - Tucson, Arizona
2001 Toward a Science of Consciousness ("TSC 8") Aug 6-11 - Skövde, Sweden (Paavo Pylkkanen)
2002 Toward a Science of Consciousness ("TSC 9") Apr 8-12 - Tucson, Arizona
2003 Toward a Science of Consciousness ("TSC 10") July 6-10 - Prague, Czech Republic (Ivan Havel)
2003 Quantum Mind 2 Mar 15-19 - Tucson, Arizona
2004 Toward a Science of Consciousness ("TSC 11") Apr 7-11 - Tucson, Arizona
2005 Toward a Science of Consciousness ("TSC 12") Aug 17-20 - Copenhagen, Denmark (Morten Overgaard)
2006 Toward a Science of Consciousness ("TSC 13") Apr 4-8 - Tucson, Arizona
2007 Quantum Mind 3 July 17-20 - Salzburg, Austria (Gustav Bernroider)
2007 Toward a Science of Consciousness ("TSC 14") July 23-27 - Budapest, Hungary (George Kampis)
2008 Toward a Science of Consciousness ("TSC 15") Apr 8-12 - Tucson, Arizona
2009 Toward a Science of Consciousness ("TSC 16") June 11-14 - Hong Kong, China (Gino Yu)
2010 Toward a Science of Consciousness ("TSC 17") Apr 12-17 - Tucson, Arizona
2011 Toward a Science of Consciousness ("TSC 18") May 2-8 - Stockholm, Sweden (Christer Perfjell)
2012 Toward a Science of Consciousness ("TSC 19") Apr 9-14 -Tucson, Arizona
2013 Toward a Science of Consciousness ("TSC 20") Mar 3-9 - Agra, India (PS Satsangi, Vishal Sahni)
2014 Toward a Science of Consciousness ("TSC 21") Apr 21-26 -Tucson, Arizona
2015 Toward a Science of Consciousness ("TSC 22") June 9-13 - Helsinki, Finland (Paaavo Pylkkanen)
2016 The Science of Consciousness ("TSC 23") Apr 25-30 - Tucson, Arizona
2017 The Science of Consciousness ("TSC 24") June 5-10 - San Diego, California
2018 The Science of Consciousness ("TSC 25") Apr 2-7 - Tucson, Arizona
2019 The Science of Consciousness ("TSC 26") June 25-28 - Interlaken, Suisse (Harald Atmanspacher)
2020 The Science of Consciousness ("TSC 27") Sept 14-18 - Online
2021 Science and Roger Penrose ("TSC 28") August 3-6 - Online
2022. The Science of Consciousness ("TSC 29") April 18-23 - Tucson, Arizona
2023. The Science of Consciousness ("TSC 30") *TBA - Taormina, Sicily (Riccardo Manzotti)*

**Conference Manager 2007-2022 – Abi Behar Montefiore*