

A SCIENCE IS BORN

Tucson III Conference: Towards a Science of Consciousness

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at

THE UNIVERSITY OF ARIZONA in Tucson there is slowly being born a curious new science of the mind.

The biennial conference "Towards a Science of Consciousness" does not merely deal with brain regions, neurons, and chemistry to understand the complex riddle of consciousness; rather, it brings together a broad spectrum of disciplines ranging from the neurosciences to quantum physics, from parapsychology to ethics. We attended this year's "Tucson III" conference from April 27 to May 2. When all of the dust had settled from hearing of the startling breakthroughs and unlikely theories revolving around the study of consciousness, it became clear that like any other branch of science, this one leaves just as many questions as answers. For every novel theory there are devoted proponents and equally dedicated opponents; and hypotheses that at first sound outlandish may very well one day become established truths.

THE TOPICS OF DISCUSSION were as varied as the speakers and the audience and included items such as the neural correlates of consciousness, philosophical questions of duality and free will, animal and computer intelligence, shamanic and altered states of consciousness (ASC), schizophrenia, dreaming and lucid dreaming, brain disorders, parapsychological approaches, neural networks, brain imaging, and quantum mechanical theories, ranging from the amazingly complex to the absurd. Of course, quantum mechanics is a wonderful playground for looking into consciousness since it is a science which is quite at home with absurdity

and contradiction. This was met with skepticism by many in attendance and with open arms by equally as many.

Consciousness and the quantum world

In recent years, several people (Penrose, Stapp, Bohm) have proposed that consciousness might arise from quantum processes on some level of brain organization. The most popular theory (Penrose, Hameroff) proposes the brain's microtubules as the place where such phenomena could take place. Microtubules are tubular arrangements of the protein molecule tubulin repeating in a highly organized fashion and are ubiquitous in any animal cell, forming kind of a mechanical support system. In the brain's neurons however, microtubule organization is even more complex due to the repetitive stacking of large arrays of microtubules. According to the theory, large-scale quantum superposition states (i.e. the simultaneous co-

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existence of several potential states) could build up in the brain's microtubules, which, when collapsing in a process called "orchestrated objective reduction," could give rise to conscious experience. Interestingly, the theory also predicts that the rate of emergence of such superpositional states could be greatly increased in ASCs, which would explain the "mental overflow" experienced by many people under psychedelic drugs.

Fascinating though this may sound, one could ask what the evidence for the involvement of quantum physical effects in consciousness is. Here we seem to leave solid ground. One rather cynical speaker offered the simple formula "whenever you have a phenomenon you can't explain, turn to quantum mechanics." The Australian philosopher David Chalmers put it in more diplomatic terms saying that the attractiveness of quantum mechanics might "stem from a Law of Minimization of Mystery" according to which "consciousness is mysterious and quantum mechanics is mysterious, so maybe the two mysteries have a common source." Another reason for the increasing interest in quantum mechanical theories

computation. He concludes that there must be a non-computational element to human cognition and invokes quantum physical effects in microtubules as a possible explanation. An interesting inference of the quantum-microtubule hypothesis is that, since microtubuli are ubiquitous in the animal realm, conscious experience might have to be attributed to much "lower" life-forms than previously argued on the basis of the presence and complexity of nervous systems. This has led proponents (Hameroff) of the theory to embrace *pan-experientialism*, which does not explain consciousness experience as an outcome or epiphenomenon of some biological process but as a fundamental ingredient of physical reality. In a fascinating and lucid lecture on this topic, entitled "On the intrinsic nature of the physical," G. Rosenberg argued the case that "physical facts are not the kind of facts that can lie alone at the foundation of a world... The problem is that they only yield a schema that requires some further content to carry it." This content, he proposes, are the so-called "qualia," the basic elements of experience. In other words, here we have a

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of consciousness may be the obvious problems with the functionalist view of the mind so fervently endorsed by the Strong AI (Artificial intelligence) community since the 1950s. *Functionalism*, particularly *computationalism*, tries to explain cognition and consciousness as pure computation arising from algorithmic processes on the brain level. In short: the mind is a computer program (=software) running on the brain (=hardware) ...but as such it could just as well run on any other algorithmic system equivalent to a computer. Decades of research in cognitive science have been based on this computer metaphor, whose influence has become pervasive, invading many other disciplines like psychology and neuroscience (have you noticed that nowadays, everybody seems to talk about cognitive processes in terms of 'information processing'?). D.W. Salt and colleagues from the University of Derby have written a paper which traces the marks left by the computer metaphor on various scientific disciplines concerned with the study of the mind. In Tucson, their provocative and ironical presentation pointed out the similarities between strong AI proponents and religious fundamentalists. But I digress...

Anyway, the practical success of the computationalist strategy in building cognitive or conscious machines is considered by many as very little, and this has spawned alternative strategies such as the quantum mechanical approach. In his book "Shadows of the Mind," Roger Penrose develops a lengthy formal-logical argument on the basis of Gödel's Theorem to show that the human mind is capable of reasoning beyond mere algorithmic

radical reversal of traditional materialism, which attempts to build mind from matter. Matter, so this new paradigm tells us, is built from mind.

Anomalies of consciousness

Aside from the myriad of theories on just what and how consciousness is there were plenty of practical presentations as well. A hot topic this year was "blindsight," a mysterious phenomenon where damage to a person's visual cortex leaves him or her totally blind but paradoxically able to respond to visual cues such as movement. Also fascinating is the subject of split-brained patients whose corpus callosum—the relay system of nerves that connects the left and right hemisphere—has been severed. In most respects these patients seem quite normal but upon closer examination we find, strangely, that to a certain degree, each disconnected hemisphere is able to sense, perceive, learn and remember independently of the other. In extreme cases, the two hemispheres may even get into "fights" when trying to preform decision-making tasks such as picking out what clothes to wear. One hand will literally wrestle with the other for dominance. Two selves in one brain?

On the subject of ASCs there was a variety of presentations that were both practical and theoretical. Franz Vollenweider gave a spectacular account of the brain imaging and psychological changes which take place under the effects of different psychotropic drugs such as ketamine, psilocybin, and amphetamine. Steven LaBerge presented an intriguing talk on lucid dreaming. On the

subject of meditation various ideas were presented ranging from how to achieve "pure consciousness" through Transcendental Meditation to using various meditative and hypnotic approaches in therapy. Dr. M. Nagel gave a long speech to the effect that since scientist types are remarkably *untrainable* in the art of meditation, the idea of "state specific" explorations into altered consciousness by scientists themselves is virtually impossible. He did not realize of course that he was presenting a perfect case in point for why more scientists should be experimenting with psychedelic drug-induced states of consciousness. It can take many tireless years of training just to realize that you are unable to attain "pure consciousness" via meditation while it merely takes a small pill and a good bit of preparation for a dazzling glimpse into such states.

While the study of ASCs opens a fascinating window into the phenomenological complexity of consciousness, there is another puzzling aspect of the mind scientific theories of consciousness will increasingly have to deal with in the future. We're

both the statistical expectance but also from control data obtained before and after the conference in a different location. Russell Targ reviewed the remote viewing experiments at Stanford Research Institute, and, as a delicate little bit of contemporary history, revealed that the CIA had in fact long been employing this technique to obtain visual information on various sites of military interest in the former Soviet Union. Now, the CIA wouldn't bother with something that isn't real, would it?

Finally, in a plenary lecture chaired by Charles Tart, Marilyn Schlitz explored the transpersonal dimensions of consciousness and reviewed data from distant intentionality and healing experiments, which indicate that a person can influence parameters of another person's physiological activity from a distance.

In light of this and other scientific evidence for the reality of parapsychological phenomena which has accumulated over the past decades, it is surprising that the "belief" in such phenomena is still cited (and ridiculed) oftentimes as a prime example of irrational and unscientific thought not to be taken seriously by

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talking of course about parapsychological phenomena. D. Bierman and D. Radin from the University of Amsterdam presented a simple and straightforward study of what they called "presentiment" effects: on a computer screen, subjects were presented with either emotionally arousing or calming pictures, with their skin conductance was measured before, during and after exposure to the stimulus (skin conductance has shown to be a good measure for emotional arousal). The results clearly demonstrate that there was a significant difference in skin conductance response between emotionally calm and emotionally arousing stimuli, which wouldn't be much of a surprise were it not for the fact that such a difference was already observed seconds *before* the stimulus appeared on the screen. The authors, after having ruled out traditional explanations for this effect, speculated that our minds are somehow able to scan the emotional content of our immediate future. They then called for replication of their results in "mainstream" laboratories in order to lend them more credence. Whoever is interested in this should get in touch with the authors (bierman@psy.uva.nl).

G.E.R. Schwartz, a psychologist from the University of Arizona in Tucson, had another interesting story to tell. Starting from the idea that "consciousness fields" can modulate the frequency of random events, he and his colleagues brought a sophisticated electronic random event generator (REG) to an international 3 day Qigong meeting in New York and found that the frequency of 1s and 0s generated by the REG deviated from

any rational thinker. But it looks like science bites its own tail there. Surely, the organizers have to be credited for their open-mindedness to include this field of study into the conference. Perhaps, at Tucson IV, they will be equally open-minded towards the idea of dedicating a plenary session to the study of the extraordinary effects of psychedelic drugs?

A manifold of perspectives

There is, of course, much more to consciousness. Fields of interest range from the search for the neural correlates of consciousness, the study of time and consciousness and evolutionary aspects of consciousness to philosophical, ethical and crosscultural perspectives, experiential, psychological and therapeutic approaches and the relationship between consciousness and art. Some of these fields tackle what David Chalmers has called the "hard problem": how physical processes in the brain give rise to conscious experience. Others take a broader and integrative look at consciousness. All of these perspectives are equally warranted and necessary in order to expand our understanding of this so familiar, yet strangely intractable phenomenon. The multidisciplinary spectrum of topics covered at the "Tucson III" conference reflected this essential variety of approaches. It can only be hoped that Tucson can consolidate its role as a cornerstone for the emerging science of consciousness. In fact, Fortune has already smiled: In December 1997, the Fetzer Institute approved a 3 year grant for \$1.4 million to the University of Arizona to establish a Center for Consciousness Studies. It

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Poetry slam

By the end of the week it had become obvious to anybody that lots of difficult and serious questions plague the phenomenon of consciousness, and many an exhausted mind may have asked itself what good consciousness is, if it's no fun? The organizers must have felt the same, for Friday night was entirely devoted to conscious amusement (although some forms of amusement may have ended in unconsciousness). Sheer hordes of conference attendants climbed on-stage to deliver their hand-made poetry—some of it inspired, some of it... well, less inspired—while an exhilarated audience laughed, heckled and shouted (mostly sarcastic) comments. After several rounds of competition, the jurors, in a somewhat chaotic process, elected the winner of the contest (who was honored with a conference t-shirt). By this time, the crowd had also witnessed a dramatically improvised and highly unlikely performance by Stuart Hameroff, David Chalmers and Pradeep Mutalik. David and Pradeep sang the "Zombie Blues," while Stuart orchestrated the audience (for want of musical instruments) which happily participated. (Zombies? you ask. In the philosophy of mind, zombies are imaginary beings who have exactly the same brain processes as we do except that they have no conscious experiences associated with them. These pitiful creatures are conjured up by philosophers to exemplify the point that the presence of an appropriate brain substrate does not necessarily or logically imply the presence of qualia.)

All in all, it was a memorable evening that lent a highly welcome personal and informal touch to the conference. It showed that serious science and serious fun are not mutually exclusive, and we trust that, after reading this article, you will be motivated enough to attend "Tucson IV" in the year 2000. After all, what better way for a vivid mind to celebrate the start into a new millennium than in a melting pot of startling theories about nature's greatest secret—the phenomenon of human consciousness. •

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See also:

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The Journal of Consciousness Studies:
www.zynet.co.uk/imprint