LOSING CONSCIOUSNESS AT TUCSON III
(TOWARD A SCIENCE OF CONSCIOUSNESS '98): A CONFERENCE REPORT

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OVERVIEW

The conference was marvelously diverse, ranging from grandmasters to the curious. Almost any metaphor and any field of endeavor was taken as a hypothetical reality for formulating a theory of consciousness. It was like a grand lottery of concepts, anyone could win, but the drawing may not be for another hundred years. Consciousness might be a combination of any or all of the following: materialism, neuroscience, quantum mechanics, mysticism, belief systems, evolution, experience, computation, chaos, philosophy, epistemology, psychology, anthropology, literature, art, and/or people. In the final analysis, this conference addressed knowledge more than consciousness, academic disciplines more than inner experiences, codification and abstraction more than observation and experience. It reflected the continuing power struggle between third-person observation and first-person experience as a basis for understanding self-aware organic systems. It sharpened the contrast between constructing models, correlating observations, interpreting mathematics, and experiencing directly. It questioned the appropriateness of its own name.

Quotes marked by '•' are from the proceedings.

TOWARD A SCIENCE OF CONSCIOUSNESS '98

One conference over 6 days, with 40 plenary speakers, 130 concurrent speakers, 300 poster presenters, and 900 attendees. Half of the crowd had research to present, most were eminently qualified professors, and there were very few graduate students. What could bring about such a confluence of expertise? The study of consciousness, naturally. It seems that everyone has one, so that qualifies everyone to an opinion. Of particular prominence were opinions which were sufficiently removed from consciousness itself to provide an objective correlate, a pretty taxonomy, an empirical model, or a good story.

At last we might understand that mysterious spark which seems to reside in our heads, what William James referred to as a booming, buzzing confusion. At last, our own personal consciousness, our most intimate anchor of self, is an object of scientific analysis and understanding. Never mind that the tools of science -- the venerable strategies of reduction, replication, and mathematical modeling -- are most poorly designed for people, much less the subjective holism of consciousness. Science brings funding. Science brings replicability. Science brings people to Tuscon.

Each day I arose at 8am to sit and listen, just barely managing to recapture my own consciousness from sleep. Perhaps here I might find some tools to tame my elusive beast. There is something ironic about looking at overhead projections of charts of EEG readouts of alpha sleep, in the early morning, in a darkened room full of other experts hoping to, well, to manage to stay awake. The audience consisted mostly of opinionated gray-haired males, with a liberal smattering of women. I felt among peers.

What is consciousness you ask? To my ears, it appeared that the predominance of expert opinion is that it is something that belongs to others, that it is just another *object* which we can stand back and observe, just another physical event to measure and meter, just an illusion of awe and soul and god.

The primary intellectual challenge, at least for me, is to understand how so many self-proclaimed consciousness experts have managed to lose their own consciousnesses, managed to delude themselves into the belief that mind is solely physical. I agree with many of the concurrent session speakers that consciousness is more-than-matter and that the evidence can be found in experience. A 'science of consciousness' is as absurd as an aesthetics of destruction.

But on to reporting. First the challenge:

- "A comprehensive theory of consciousness must explain, not only self-awareness, perception, 'states of consciousness', and the self-aware entity, but all phenomena and noumena that are radically-related to these, including life itself, telepathy, PK [psychokinesis], OBEs [out-of-body experiences], precognition, morphogenisis, quantum coherence, and the homing and migratory behavior of animals."

This list seems painfully abbreviated. Better: consciousness study includes all of human experience, culture, thought, physiology and artifacts. It may include the nature of the Universe.

Here is a classification of the dominant theories about the nature of human consciousness, and an estimate of the percentage of speakers supporting each.

1. Materialism, mechanism (30%): consciousness is physical transactions; electrochemical pulses in a wet machine.

2. Functionalism, architecture (30%): consciousness is similar to a computer, using a different, wetter architecture in a different type of material substrate to perform the same abstract acts.

3. Connectionism, transmission (20%): consciousness arises out of myriads of signals transmitted simultaneously throughout the brain.

3. Quantum mechanical, physical (10%): consciousness occurs due to intricate quantum events occurring deep within the minute structural cytoskeleton of each brain cell.

4. Bohmian holism (5%): global consciousness is the superposed, holistic quantum potential of the universe; local consciousness is a condensed quantum event.

5. Emergence (5%): consciousness is an epiphenomenon arising from the coordinated action of many tiny events, emerging through the self-organization of the ensemble.

6. Spiritualism (1%): consciousness is a manifestation of a greater source which cannot be reduced to physical transactions.

7. All of the above (0%): all interpretations are views of a larger elephant. No speakers (that I heard) acknowledged this; everyone had a specific theory or flag to wave.

8. Unknown (0%): we do not yet have the tools or techniques to understand consciousness. Few speakers advocated a radical change in methodology, although the range of proposed methodologies was a diverse as humanity itself.

The following sections characterize the conference by academic disciplines, the same schema used by the program committee to organize the research abstracts.

MEDICAL NEUROSCIENCE

The neuroscientists definitely have interesting results. They exhibit the CAT and PET scans of poor subjects with brain disabilities as their brains burn sugar. We see that, amazingly, different areas of the brain burn more sugar when we engage in different mental acts. They show formerly healthy animals with imposed brain lesions, using a classical reductionalist methodology which assumes that the whole brain is a sum of its disconnected parts. We come to understand the incredible complexity of our brains: massive connectivity, hundreds of specialized types of cells, intricate cross-wiring, dedicated but plastic functionality, electrical and chemical and even quantum systems coordinated in intricate dance. Not consciousness, but an interesting biological system.

The rallying cry of neuroscience is 'neural correlates of consciousness'. The idea is to watch a person engaging in consciousness while at the same time watching some neurological measurement, and derive correlates. No this is not causal modeling but it is fun. Well, there is one other small point, we can't really know when a person is engaging in consciousness, so for now the neuroscientists are watching people engaging in seeing or hearing or imagining or dreaming.

The evolutionary development of the brain shows several distinct structures which unite us with the other apes, with the mammals, and even with the reptiles. We humans have a new and unique thing in our heads: prefrontal lobes. These overdeveloped lobes have apparently unique processing areas. They are far removed from the sensory-motor pathways. They specialize in concepts and ideation and symbolic memory and the future. And they are distinct from the seat of our awareness of these things deep within the limbic system.

Blindsight, which I had never heard of, received a lot of attention. Blindsight is the phenomenon that blind people, having no awareness of sight, still respond to visual events. Its existence proposes a problem: awareness is a parallel process with perception. The eyes and the mind still function without the presence of visual awareness; the blindsighted do not see and have no awareness of seeing, yet they can respond perfectly to some visual tasks. Awareness and functionality are dissociable.

After overcoming my naiveté about blindness, I could see some reason in the idea that awareness is not central to registration, interpretation, and action. Freud's subconscious strikes again. Some neurophysiologists called this the Iceberg Phenomenon. Our awareness is only icing on the cake. Yet, at least to us humans, it seems so essential. I can recognize my own blindsight while typing. I know almost every typographical error by a vague feeling of wrongness, yet often I cannot see the typo at all, even after a conscious search. The phenomenon generalizes. Deaf-hearing. Numb-sense. Sleep-walking. Subliminal-learning. People with behavioral disturbances caused by brain damage suffer from a variety of blindnesses of the conscious, such as an inability to integrate a sense of self, or an inability to follow a plan, or even the inability to recognize only faces.

Our senses all operate below thresholds of awareness. People can accurately identify sights and sounds and smells while believing that they are guessing, since the stimuli are below the threshold of conscious awareness. Only a small fraction of the information gathered by perception is available to our awareness, even when it is above threshold. On the other hand, awareness fills in for perception when something is missing, in effect providing information during interpretation. An example is peripheral vision. The world to the side of our visual focus is still detailed even though the cells in our eyes have very low acuity in that region.

Our senses operate when they are not expected to. People under surgical anesthesia can vividly recall surgical events. People with no physical control of an arm insist that their arm is fine but their motivation to move it is too weak. People feel lost limbs, phantoms but very real to experience. People learn implicitly, without effort or awareness.

What computer scientists call sensor fusion, the neuroscientists call the binding problem, and the philosophers call the Hard problem. What property of

the neural system unifies the various modalities of perception so that we can be conscious at all? We know that the senses have vastly different physiological mechanisms, but how can consciousness access all of them as one continuous, complex event? Such are the burdens of a materialistic worldview.

An example theory is the 40Hz Solution which posits a synchronizing wave of neural activity every 25 milliseconds.

- "'40Hz' neuronal oscillations may underlie a consciousness-generating mechanism within the brain."

This quote is an indicator of how far folks are reaching to understand themselves. Unfortunately, external events do not trigger sensation at this same frequency. Unfortunately, the brain seems to interpret sensor fusion as a spatial rather than a temporal issue. This of course raises one of the central wonders of consciousness: that we can and must integrate and make continuous sense of anything. We cannot help but see things as a unity, regardless of any kind of reality. The perceptions of those with physical brain damage, our construction of past events, integration of lies, dreaming, hallucinations, all make continuous sense from the perspective of the interpreting brain. Binding is a fundamental feature of consciousness; it is fragmentation and discontinuity of awareness that are never experienced. It is only from the outside that we interpret our senses to be different systems.

Those who study the limbic system say that the fundamental processes of consciousness (attention, emotion, decision making) all come from the same structural substrate, and are very difficult to separate as separate neurological correlates. They are arguing for a sort of perceptual binding in reverse, that it is again from the outside that we are constructing separate modalities for essentially the same neurological process. All cortical thought cycles though the emotional limbic system. The limbic system however has no clearly delineated boundaries, its connectivity weaves through the rest of the brain, from its very center. Specialization seems to occur in the outer cortical regions, at the extremities of the brain's topology. The limbic system colors all thought, it tells the cortex what is real and what matters. It focuses us, it motivates us, it regulates our sleeping and waking, it controls our awareness of thought. Limbic disorders can erase awareness. And large sections of limbic neurons develop after the age of two.

Here is what those neuroscientists say about what's minding the store. The specialty of the author is noted.

- "Conscious thoughts occur as a result of the production of multiple states or 'pools' of spatiotemporally patterned neuronal activity in the mammalian cortex." (neuroscience)

- "Emotion is a central organizing process for consciousness." (neuropsychology)

- "Consciousness is the current winner of Darwinian copying competitions in the cerebral cortex." (behavioral science)

- "Two sources of consciousness are present before and during birth: a somatic source whose functioning seems to be bound to the physical body and to evolve slowly as the central nervous system evolves, and a fully mature source of consciousness whose functioning appears to be more or less independent of a cellular substrate." (prenatal neurology)

- "God is somewhere, somehow, in the overall organization that gives rise to so many different emergent properties at so many different levels of structure. Of course, such a terribly awkward global formulation is not what we are looking for and satisfies neither the scientist nor the mystic." (neurophysiology of affect)

- "Unconscious cognitive and behavioral processes contribute significantly to disorders and diseases, and conscious awareness and release from unconsciously conditioned egocentric processes contribute significantly to healing and health." (medicine)

- "Consciousness is the brain's natural Virtual Reality or Telepresence system." (cognitive neuroscience)

I cannot resist a comment on the previous item: VR is a very recent technological concept. Why do we believe our most intimate processes to be like the latest technology? The computer technologists who developed VR did not conceive of it in any way as being like consciousness or the mind. Instead it was supposed to be like physical reality, so that the mind would find the virtual experience familiar, comfortable and entertaining. The computer culture did not conceive of neural correlates to VR, although they did believe that the virtual environment could model dreams and archetypes. Language and story reach deep within technical innovations to capture their image as well as their function. The conceptual collapse of organism and artifact continues:

- "The brain is more like the Internet than like a computer."

- "The Net as it exists today is comparable to the mind of a very young child."

Other highlights from the frontier of neuroscience:

- Monkeys have 'mirror neurons' which trigger only when both the monkey grasps an object and the monkey sees another monkey grasping an object.

- Predatory psychopathic murderers have fast sensory processing.

• Purkinje cells [a densely connected type of brain cell] have a fractal dimension of 1.72. When starved of blood, their fractal dimension decreases to 1.36.

• Rats laugh. Juvenile rats laugh a lot, especially when they are playing. 'Full body rapid manual stimulation' (i.e. tickling all over) makes a rat joyful.

• Birds have a cerebral cortex.

• Gentle handling of mammals, birds and lizards, but not frogs and fish, produces emotional correlates such as higher body temperature and heart rates.

PHILOSOPHY

Next the philosophers, professionals who construct questions which cannot be answered so that they might reach the eternal through endless debate. A field which includes many of the greatest consciousnesses in history.

If there were a high priest of philosophical consciousness, it is David Chalmers, a young, long-haired author who has written a brilliant analysis of our knowledge of consciousness, a book quoted by half of the papers. Chalmers discovered that there is an Easy problem and a Hard problem. To better explain this discovery, I will backtrack into some philosophical conundrums.

Qualia are those mysterious somethings which we experience as experience. Um, perhaps that is too philosophical. Qualia are the sounds and sights and touches that we feel to be basic experience. They are what makes the color red experienced as red. They are the property experienced after the thing which has that property is removed. Perhaps that too is too philosophical, but we have reached the bedrock of the Easy problem: how do qualia work, just how do we experience red as red, loud as loud? Qualia used to be a respectable philosophical problem, before we began to understand how our bodies work. Now they are the Easy Problem. Red is an integrated response of our visual system. Never mind that the same external signal can illicit idiosyncratic internal interpretations. Never mind that the perception of a color is relative to the adjacent colors. Qualia are too easy.

Some philosophers have constructed non-experienced qualia, you might say qualia potentia or qualia-space. Qualia not generated by an experience of an object's properties, but qualia which theoretically might be experienced. It is like moving money off of the gold standard, qualia can been moved off of the experiential standard. No, this doesn't help with the Hard problem, since any solution to the Easy problem is not a solution to the Hard problem.

The Hard Problem is how our minds manage to integrate the varieties of qualia into a coherent experience of consciousness. Put another way, where do qualia

come from? How is it that we experience at all? How does this gol-danged thing work anyway?

For example, mathematics seems to arise subjectively from nothing at all. At best it is a subtle and intricate tangle of very abstract abstractions. Yet somehow it seems to describe the nature of physical reality. Mathematics is made of the new-fangled qualia, the type that do not need experience. Is it real or is it ideal or are real and ideal intimately blended? Damn hard to pin mathematical abstraction onto direct experience. We know that the baseball player in center field moves exactly to catch the tiny orb hurdling at him from the heavens. Most of us are also certain that his mind is not computing differential equations and then feeding them to his legs. The Easy problem is identifying how mathematics does relate to reality. The Hard problem is explaining why it relates at all. The Easy problem is engineering; the Hard problem is fabricating.

Sometimes it pays to be cautious when constructing theories on imaginary bases. A small voice cries out: there is no Hard problem! It is created only by forgetting that qualia are first-person experiences, not third-person observables. There is no hard integration problem cause there is nothing being integrated. Experience is a unitary whole.

Phenomenology is a philosophical perspective that does make a legitimate contribution to understanding consciousness, by putting consciousness first. Consciousness is not a derivative concept, it is fundamental to appreciate experience. Phenomenology calls for a hard-nosed first-person analysis. There were no phenomenologist philosophers at Tuscon III, although they did come to the prior two conferences. Several thoughtful speakers advocated for direct experience, including Joseph Goguen, the Editor-in-Chief of the primary Journal of Consciousness Studies. He baldly stated that phenomenology is the only reasonable philosophic approach to consciousness, that there are phenomena such as human language which cannot be derived from materialism.

Here are some of the proposed philosophical explanations of consciousness:

- "The everyday researchers in psychology and the neurosciences are operating under the unspoken assumption that a theoretical reduction of consciousness to neuroscience is the goal, or at least will be the final outcome, of all research in cognition." (philosophy)

- "The unity of consciousness =definition= a representing in which a number of representations and/or objects of representation are combined in such a way that to be aware of any of these representations is also to be aware of other representations as connected to it and of the whole as a single complex representation." (interdisciplinary philosophy)

- "Consciousness is an agent's state resulting from the sameness of one or more of the information aspects in that agent's not denied information state or states with one or both of that agent's own aspects." (philosophy)

- "Qualia space Q is the space of all possible perceptual experience....Q is a closed pointed cone in an infinite-dimensional separable topological vector space." (mathematics)

- "Because culture has a role in forming brains and consciousness, consciousness is a conflated physiological/social system-in-the-world. That is, the mind can be seen as a physiologically embodied, meme-driven resonant circuit." (neurobiology)

- "Presenting consciousness as an illusion within a computational model of reality compliments the Hindu view of reality as the illusion of maya, and the Buddhist view of the self as illusion" (linguistic psychology)

- "Consciousness is an epistemological ontological problem." (cognitive and computational neuroscience)

- "Consciousness is of negligible epistemic interest in its own right...consciousness itself cannot be anything other than epistemically vacuous (and any ideas to the contrary are bound to be incoherent)." (physics)

Here are some clever presentation titles that suggest, at least from the perspective of the English language, that the topic is somehow convoluted:

- Towards a science of consciousness and towards a consciousness of science
- Epistemological ontology and ontological epistemology
- What is it like to think that p?
- What kinds of philosophical zombies are possible in what sense?
- What is quantum animism?
- Why is the paranormal weird?
- Did consciousness cause the Cambrian evolutionary explosion?
- Good old fashioned sin: a neglected area of consciousness studies

The central philosophical debates are

1) physicalism or mentalism
2) monism or dualism (ala Leibniz and Descartes)
3) materialism or idealism
4) argumentation or mysticism
5) third-person (objective) or first-person (experiential)
6) emergence or reductionalism
7) science or phenomenology
8) is there a Hard problem? Is it too hard?
9) what is the function/purpose of consciousness?

Seems like everybody is ready to pick a fight with everyone else. These opposing schools appear to be variations on a theme: is it objective reality

which contains consciousness, or is it conscious reality which contains the physical? Does mind matter, does matter mind?

Do note that these issues are only debated by philosophers. Scientists appear to have made up their minds, that is, they believe that their minds are not made up. They do not believe in the non-physicality of their minds. Mystics and humanists appear also to have made up their minds, that is, they believe that their minds are made up. They do not believe that their minds are made solely of matter. The field of philosophy does not yet know, rather it supports such individual diversity of opinion that even after two thousand years of debate what matters is each philosopher's own idiosyncratic perspective. It is as if the philosophers are saying that if you think hard about it, you must conclude that what you come up with is as valid as what anyone else comes up with.

I must take a diversion here, to issue a complaint. In mystical and religious traditions, and yes even in the psychological (introspectionalist and clinical) and phenomenological traditions, the requirements for a thoughtful commentary on the mind include some experience of mind. Our academic culture fosters a tragic illusion: that we can understand merely by listening and talking. That it takes no effort, no work, to think. But alas, mystical traditions assure us that it takes ten, twenty years, a lifetime of devoted practice to reach a clear vision of consciousness. Academic philosophers do spend many years examining their thoughts, their concepts, their models. So long as their conclusions are publishable. But these are not consciousness. Concepts and models are the finger pointing to the moon. The moon, the clear consciousness, is found by eliminating concepts and models, not by reifying them. So my challenge: to be a philosopher of consciousness, one must be able to spend a substantial amount of time, say a full minute, in their own mind *without thoughts*. One must at least have a direct experience of consciousness, one uncluttered by theory and model and image, before commenting on the nature of consciousness. This might reduce the number of consciousness philosophers to a handful.

PHYSICS

The physicists, particularly those who had already made their fame, were among the most thoughtful contributors. They understood the universe, now they turned toward themselves. Quantum mechanics, the tool which had been so emanately successful at predicting the strange ways in which matter/waves behave, must surely explain consciousness. After all, the top priority of physical quantum mechanics for over fifty years has been to find a tractable interpretation which eliminates that pesky 'human observer' from the quantum mix. And the agenda of removing the demon subjectivity had gloriously failed. Thus consciousness itself must be quantum mechanical.

How, you might wonder, could Planck scale events turn into the motivations which move our bodies? 10^-36 meters is mighty small, some 30 orders of magnitude smaller than cellular structures.

• "If electromagnetic waves [from neuronal firings] are synchronized, then the photons can form extended coherent states and amplify quantum superpositions to macroscopic scales. Decahertz photons in the cerebral cortex may form macroscopic coherent states that collapse due to thermal interference."

It's the hot mammalian brain which creates consciousness through synchronized brain activity triggering quantum collapse events in the cytoplasmic matrix of brain cells. The problem of course is that quantum coherence does not occur at body temperatures due to thermal noise. We have no way of holding the superpositions which are to collapse to create consciousness. The necessary coherence is only in purely isolated systems. Quantum mechanics to date cannot even address a description of water.

There are three primary interpretations of the equations of quantum mechanics:

1) standard/Copenhagen
2) many universes
3) Bohmian

We have a choice: either consciousness somehow collapses the potentia of the wave function, or that potentia is realized in an infinity of orthogonal universes, or the universe itself is a single wave function. The latter Bohmian view is best suited to support the idea that the universe is sentient, that consciousness is a universal. In the Copenhagen interpretation, the wave function is a mathematical device. In the Bohmian interpretation, the wave function is quite real, containing objective and active information which serves to organize, well, everything. Bohm's wave function deterministically guides the evolution of reality, it is Consciousness incarnate.

Quantum mechanics has wrestled with the non-locality paradox since its inception. The quasi-magical concept of superposition, that quantum equations hold all possible events in suspension, in non-differentiation, stretches to permit an interpretation of universal connectivity, the consciousness of god. But few recognize either the sacrilege or the loss of subtlety when they posit that this newage physical theory is identical to god. After all, physicists of the objective kind have never been burdened with metaphysics, their theories have never been subject to the subjective.

"There's a lot of quantum 'metaphysics' going on," said Victor Stenger, a professor of physics and astronomy at the University of Hawaii. He insists that even the oft-cited quantum mechanical term 'nonlocality' exists only as a theoretical concept. He further asked: "And is this thing we call the wave function real or not? -- or is it just an abstract mathematical concept that we [physicists] use to describe things?"

So what we get is physicists acting like two kinds of amateur theologians. The first kind, call it Old School, shoves delicate spiritual, cultural, and intimate experience into the venerable equations of Schrodinger, Heisenberg, Planck, Bohr and Dirac, constructing interpretations which subjugate humanity to physical law. The second kind, call it New School, shoves delicate physical, probabilistic, and mathematical modeling into the venerable creation stories of the diverse cultures of humanity.

Old School continues to miss the point, that objectivity too is a social construct, that there is (by demonstration of personal experience) something other than meat and material. Old School includes some grand masters of the scientific trade, Penrose and Crick and Simon. Old School lectures make you slap your head and say "Oh no! They did such good work, but now they have forgotten themselves."

Here's an Old School quote:

- "What do we even mean that we have consciousness -- other than the functioning of the laws of nature as they govern the matter we're made of?" (Charles Bennett, a Fellow at the IBM Thomas J. Watson Research Center who spearheaded the quantum teleportation research)

New School, in contrast, provides the same entertainment value as the hippies, using wonderful scientific mumbo-jumbo to miss both the scientific and the humanistic points. New School includes the clowns of physics and the wanna-bes of the cultural fringes. Too straight to be newage and too weird to be funded. New School lectures make you chuckle and look for some drugs.

Here are some New School quotes:

- "Several of the key concepts of quantum mechanics (non-locality, indeterminacy, and the role of observation in the collapse of the wave function) have shown themselves to be potentially very useful in constructing a model of consciousness....QM can also be construed as an unconscious fantasy structured by the desire of the scientist to construct a non-linear, non-rational model of the physical (and psychical) universe(s) as it challenges the very notions of Aristotelian identity, contradiction, and causality."

- "Controllable non-random post-quantum consciousness lies on the mesoscopic edge between uncontrollable quantum randomness and classical, but chaotic, determinism."

- "The higher brain is a chaotic system and consciousness its strange attractor."

- "It is the neuro-transmitter 'serotonin' which is associated with neuro-psychodynamic space-time curvature."

• "The square root of -1 turns what 'is there by itself' into what appears to Consciousness."

• "Mind (or self) is a physical aggregate of the non-propagating effervescent light made of macroscopically condensed photons (light quanta) trapped in the vicinity of the biological constituent matter of the brain such as membranes, ordered water, cytoskeletal filaments and microtubules. Consciousness is the dynamics of those macroscopically condensed photons suffering from interactions with the external systems of the biological constituent matter, and described by the well established quantum electromagnetic field theory."

As one presenter put it: "What really is real? Don't ask me, I'm just a theoretician."

PSYCHOLOGY

A few psychologists attended. A few experimental psychologists, that is, since people who actually study consciousness, the clinical psychologists and psychotherapists, were obviously not scientists, and not in attendance.

• "Conspicuous by their absence have been the very people who work daily with human brains and minds, in the most intimate and direct fashion: psychiatrists."

The experimental psychologists proudly pointed to tachistoscopic results: stimulating words and pictures (i.e. sex and violence) flashed faster that the eye can see still engender conscious recognition and physiological response. Certainly awareness is not the executive in our heads. But, alas, Freud is the arch-villain of the turn of the millennium. The nerve of him suggesting that the subconscious runs the show. Any experimental psychologist worth his pay knows that only that which occurs overtly to conscious awareness exists. Behavioralism at one point actually denied the very existence of consciousness.

To a psychologist, the main features of consciousness are

- the differentiation of subject from object,
- focal attention,
- separation of figure and ground,
- verbalization,
- volition, and
- the flow of time.

• "Consciousness constitutes a cognitive and motivational straitjacket which 'subjectively forces' animals to act in an adaptive, and (inclusive) fitness maximizing, manner in unpredictable environments."

- "States of consciousness (waking states, dream states, etc.) contextualize various states of mind (eg, sadness, joy, anticipation}, and structures of consciousness (rational, mythical, magical, etc.) contextualize state of consciousness."

- "There are no 'normal' and no 'altered' states. There are simply usual and unusual states of consciousness that depend very much on where an individual focuses their attention."

Some other interesting results:

- In contrast to blindsight, some perceptions necessarily require consciousness. Perception of differences between irregular verbs (do vs did) and irregular plurals (goose vs geese) does not take place subconsciously at all. It is as if our language forces our conscious attention.

- Classical conditioning (ring the dinner bell and you feel hungry) was first studied in Pavlov's dogs. It occurs in humans too, but importantly, only when the human subject is consciously aware of the association. Since nothing else differs in human and dog experiments, for conditioning to occur in dogs, they too must be consciously aware.

Dream research is important since it provides a direct road to an 'alternative state of consciousness':

- "Dreaming consciousness is characterized by seeing things that aren't there, believing things that in waking would be dismissed as logically absurd, and mixing up people, places, and times. Moreover, there is no conscious selection of what to dream about." And yet, dream content is narrowly selected, apparently very relevant, and dreams themselves are quite structured by storylines and waking events.

- Like blindsight, we continue to monitor our environment during sleep. Insomniacs are hyper-vigilant during sleep.

- Lucid dreaming (conscious decision making during a dream) can be learned.

- In a random sample of over 1000 adults 20% reported recent lucid dreams. "Spontaneous lucid dreamers in Austria seem to struggle more with quality of sleep and quality of life, especially on the physical side."

- The reclaiming of waking mental functionality during lucid dreaming occurs in the opposite order that features are lost while going to sleep. In lucid dreaming, we first gain awareness, then disengagement from the setting, then volitional control.

- Dreaming and waking fantasies are the same. Estimates of time duration, rate and type of respiration, movement corresponding to muscular twitching,

and response to sexual activity are also the same while both waking and dreaming. In general, dreaming and waking are very similar states.

One fringe group, the parapsychologists, were ready to capitalize on tachistoscopic awareness. Turns out that people respond to emotional stimuli *prior to* the stimuli. It is not the subconscious which hides us from ourselves, it is time itself. Not only do we know without consciousness, we know prior to experience. And the parapsychologists, as usual, swear that this is replicable, that it is science too.

COMPUTER SCIENCE

My particular interest is Computer Science. The computer scientists were not in strong supply, but their way of thinking influenced most presentations, with the exception of the physicists. The philosopher Hilary Putnam introduced the world to functionalism in the 1960s. The mind must work somewhat like a computer, since there is only one abstract way to process information. Humans have a different architecture, but functionally, we and the computer do the same thing. The idea of functionalism was immensely appealing, and over the last thirty years, nearly every academic discipline has adopted it in some variety. It is the cornerstone of Cognitive Science. The information processing model of Newell and Simon must describe all rational activity, since rationality is by assumption the mental manipulation of symbols. Since there cannot be too much of a good idea, many functionalists take this literally, the mind *is* a symbol processing machine, a computer in fact. We just need to decipher the internal representations. The other school of functionalism, in contrast, remains abstract. The mind processes information with a different kind of architecture and substrate.

But then the 70s and 80s furnished many spectacular failures of the information processing model. Natural language was too difficult, machines lack sensory grounding, vision is not reductionalistic, robots are uncoordinated, logical deduction cannot cope with the frame problem, sensor fusion is intractable, decisions are based on emotions. Well, then, the functionalists reason, machines must exhibit artificial, alien consciousness. Consciousness none the less, but of a different type. Thank goodness for science fiction. More serious functionalists merely extended the deadline for solution of these problems another fifty or so years. And increased their bag of tricks with new labels for old technologies: parallel distributed processing, situated agents, virtual reality, web consciousness.

But good old Putnam, in the 90s, completely repudiated his own invention of functionalism. Pointing to the elaborate non-algorithmic aspects of language, to normative, situated, ambiguous, multifaceted speech, Putnam erased all common ground between person and computer. Humans are cultural, unique, diverse. We are not machines! Very few have listened.

At Tuscon III there was a session in which folks showed collections of algorithms running on a computer. They named their algorithms things like attention and memory and motivation and even consciousness. This then gave them permission to ask if their code was indeed conscious. And to answer Yes. Apparently computational algorithms are not required to meet even the conditions of face validity.

There were several computer scientists who claimed that the subsymbolic processes of neural networks modeled consciousness. The architecture of mind is not that of a Pentium processor, it is that of a huge network of little adders. And besides which, the name of that architecture contained the word 'neural', so it must model consciousness.

But in the same absurd computational session, perhaps the wisest paper of the conference was presented by Joseph Goguen. A world-class designer of computational languages and a computational theoretician, Goguen quietly pointed out in his paper "Poetry, Mechanism, and Consciousness", that computers cannot cope with poetry, and could never cope with poetry. That science cannot cope with poetry, or the human use of language, or with the depths of human expression. His tone was one of incredulity, that so many could be so deluded.

- "Is it not obvious that mere computation cannot evoke pleasure or pain; that it cannot perceive poetry or the beauty of an evening sky or the magic of sounds; that it cannot hope or love or despair; that it cannot have a genuine autonomous purpose?"

MYSTICISM

Some folks have actually studied consciousness for thousands of years. The mystical texts and traditions of Hinduism, Buddhism, Christianity, Judaism, Sufi, Navajo, and others were paid brief homage by a few. Too bad that their methodologies included silent contemplation and ecological respect, for this disqualified them from serious consideration. No mathematical model, no sense, no methodological legitimacy. The voice of Actuality came only in muffled tones:

- "To understand consciousness, scientists must learn a totally different paradigm....They must stop equating sensory experiences with true knowledge, which can be acquired only by directly cognizing infinite existence through focusing attention and energy on a specific point in the heart." (Sufi)

- "God and the non-dual experience of pure consciousness are one." (yogic philosophy)

- "The experience of 'pure consciousness' is reportedly obtained when attention withdraws from all phenomenological objects of experience, and

mental activity settles down completely, leaving consciousness alone by itself independent of all empirical qualities whatsoever." (philosophy)

• "The functions of consciousness cannot be separated any more than can parts of the universe." (synesthesia studies)

• "Consciousness is an infinite community of awareness, a dynamic, interdependent reality. Ontologically, it is a unity with distinctions, or the metaphysical actuality of irreducible distinctions within the ultimate unitary nature of the Absolute itself." (theology)

• "Each mode of consciousness -- with, of, and towards -- emerges from its unconscious background in five stages of increasing complexity...
(1) (abiding) primordial sensitivity,
(2) (expanding) emergent sentience,
(3) (pre-personal) awareness,
(4) (personal) experience, and
(5) (symbolic/semiotic transparent) reflectivity.

I have included the above quote, not because it necessarily contains wisdom, but to illustrate a common occurrence. Most mystics, and almost all academics, feel free to construct schemas, templates, taxonomies, orderings, and/or theories which sound reasonable but actually reflect one's personal perspective. And that perspective is usually abstracted and conceptual. These schemas have many common patterns, such as putting cognitive acts on a higher plane than physical acts. The question is whether or not any of these theories should somehow be more consensual, more communal, than the ideas of one person and some friends.

Perhaps the mystics have something in suggesting that consciousness is a different thing for each person, that *uniqueness* is the underlying order of qualia, both imagined and experienced. The opposite pole of uniqueness is also expressed widely by the mystics, that everything is One, that consciousness is a singular concept. These theories, or more properly attitudes, differ significantly from scientific attitudes, which rely on causal determinism and randomness to explain structure. Science strives to find abstractions which simplify reality, so long as you don't look at the fine details that each abstraction blurs.

Is it in our best interests to attempt to condense, abstract, conceptualize, simplify, understand, or explain consciousness? Is it not possible to have a class of phenomena which are intractable to the degradation of communal understanding? Why should knowledge be defined as consensual or effable or even experiencable? This themes, of course, are fundamental to many metaphysical systems. But mysticism does not lend itself to honest debate, cause to a mystic "he who talks loudest knows least". What went through my mind during many sessions of Tuscon III was a similar homily: "Communication acts are always messages to oneself." Standing in public to theorize about the sacred (and I do consider consciousness sacred) is just another way of

declaring lack of understanding and experience. Come to think about it, this report is also a declaration of ignorance. It is only in the section on mysticism that ignorance and silence make sense as an ultimate goal.

• "Language, with its never ending and noisy flux, tends to confound itself with reality, and imposes its own categories on it....The 'way of the elementary' finally consists in different techniques to break with the flux and make silence possible."

Other interesting bits from the universal conscious:

• Psychoactive drugs have little effect on the patterns of neural activity measured by PET scans. Alteration of the perception of space and time and loss of ego-boundaries occurred with excessive activity only in the frontal cortex.

• Protracted visual hallucinations pass through phases which recapitulate the functional stages of the visual pathway itself.

• Mediation can repair one's own DNA.

• The idea that everything has some degree of consciousness, that even rocks have experience, is called *panexperiential psychism*.

WEIRD SCIENCE

I cannot do better than the bare quotes here:

• "Dowsing for the nodal lines of the vortices surrounding any object reveals a universal topological structure based on dual tetrahedral geometry containing embedded toroidal fields."

• "Instrumental transcommunication [is] anomalous voices on audiotape against a background of artificial noises. Subsequently, Meek and O'Neill were able to obtain not only voices but images on a television monitor. More recently, voices and images have occurred not only on tape and television, but also telephone, facsimile and computer."

• "The tragic death of Princess Diana generated a worldwide reaction....We hypothesized that the worldwide sharing might produce an effect on the random event generator." [It did.]

This is my favorite abstract:

• "There are two barriers which impede the elucidation of the model proposed in this paper. The first is that nothing less than the sum total of the words of which it is comprised will explain it without an at least partial misrepresentation. The second is that, since the model will be exhibiting

what it proposes, nothing short of an interaction with the paper, that is to say an experience of it, will render whatever truth-value it possesses true."

HUMANITY

In the 1960s, the psychological community pointed out that consciousness was like the blind men's elephant, each person who touches it thinks it a different thing. This lack of communal definition still dominates, but the progress over thirty years has lead us not to care about that. We can all talk about the 'it' of consciousness while not really facing the truth that the 'it' being discussed ranges over experience, belief, perception, awareness, physics and metaphysics. In fact, 'it' is not a thing at all. Minimally it is a complex process, beyond objectification. Gödel used self-reference to demonstrate unreachable numerical theorems (either by virtue of being inconsistent or of being unprovable but true). The self-referential aspect of dynamic consciousness, even by the standards of modern mathematics, makes it too unreachable.

- "Any understanding of consciousness must allow for the existence of multiple and even mutually contradictory conscious realities that nonetheless operate either within an individual stream of thought or among plural subjectivities within a community."

The Humanities were also in presence at Tuscon III. English professors argued that great literature was the key to understanding consciousness. Every great writer talks about their mind and about the mind. Faulkner, Wolff, Wordsworth, Blake and Anne Frank, to name a few, were deconstructed. Art, music and religion also claimed an inside track to understanding, as direct (non-scientific) expressions of consciousness.

- "Literary/metaphorical thought is the essence of the search to locate and define consciousness insofar as it both instantiates and inquires into consciousness simultaneously."

- "Consciousness is at the top of the agenda of contemporary art."

- "Consciousness is nothing but the awareness of ourselves and also of the universe around us. It is something much higher and more powerful than the mind. It actually watches the mind."

- "There is no Hebrew word for 'mind' in contrast to 'body' or vice versa. The biblical language only knows terms for the unity of human beings seen under a certain aspect -- his/her vitality, her/his mortality etc."

- "The human hand -- in itself, as the metaphoric Hand-of-God, and in the abstract -- is the pointer of conscious will that aims the spotlight in the theater of consciousness."

There were a small number of representatives from other than Western cultures, including a contingent of Native Americans. With them were a few anthropologists. Their voice was consistent: models of consciousness are highly culture specific. These 'native' approaches were invariably embedded in a social/cultural context and were very non-Western-scientific. Here is an outline of the features of most Native sciences:

- "(1) Anchoring inquiry within proper intentions and cultivating a psycho-spiritual stance where 'the researcher must learn to find a quiet place within, to ensure balance'.
  (2) Primacy of direct experience.
  (3) Approaching social issues in ways that emphasize oral history, people's knowledge, situatedness in a cosmological universe, in the ecological realities, in communal (tribal) concerns.
  (4) Seeking guidance from and validation from the [often dead] Elders.
  (5) Emphasis on ethical dimensions.
  (6) Receptivity of knowledge presented in different modes of consciousness, such as dreaming and visions."

Surprisingly, the non-presenting half of the audience (and a substantial proportion of the poster presenters) seemed to support consciousness diversity. The audience paid rapt attention to all, but responded to those who affirmed that the mind was more magical than physical. Did the audience know another truth? Or were they too deluded by folk wisdom, lacking deep thought? Just who was oblivious, speakers or listeners? Who was most deluded, those who spoke confidently about the contents of experience, or those who wondered about it?

SUMMATION

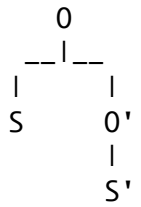
Piet Hut, a physicist from Princeton, on the last day provided the clearest perspective on a synthesis of the divergent perspectives. He contrasted three approaches to the study of consciousness (science, phenomenology, and a variety of Buddhism), each of which has evolved independently over hundreds of years. His claim is that they are convergent approaches.

In Hut's model, any commentary must be based on an experiment about, an observation of, something. This observation is expressed by a representation, making it not the same as the actually of which it is an observation. Thus, an observation about consciousness generates a representation of consciousness which is not the actuality of consciousness. Hut formulated a theory of representation rather than one of consciousness in order to unite divergent approaches, using the good old finger-pointing-at-the-moon argument that Korzybski's General Semantics made famous in the 1930s.

Let O' be the observation of consciousness. Note that the idea of an objective reality is not yet necessary. Let S' be the representation of consciousness constructed by the observation. In a complementary fashion, we

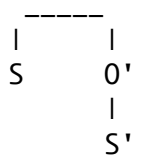
let S be actual consciousness and O be the actuality which is being observed. (Please ignore the contradiction that everything above is a representation rather than an actuality. See it as an instance of what it describes.)

Hut's model of Science is then:

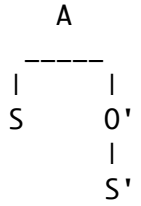


Science postulates an objective reality (O) which subsumes both the subjective consciousness (S) and the act of observation (O'). A science-of-consciousness is about the representation of consciousness (S') generated by the observation O'. That is, about the linkage O'--S'.

Phenomenology posits actual consciousness and the same model of observation as does Science. The difference is the absence of an objective reality on which to base the observation O'. A phenomenology-of-consciousness is about the entire linkage in the diagram.



Buddhism posits an actuality (A) but one removed from consciousness and from observation. In that way Buddhism is very similar to Phenomenology and to Science. A Buddhism-of-consciousness is about the entire linkage in its diagram, but its "reality" is not subsumptive, not linked.



Science grew out of the assumptions of classical Newtonian physics; phenomenology, out of Cartesian dualism; and Buddhism, out of the metaphysics of the Asian continent. Each shares a similar approach to methodology, logic, and world view (the S--O'--S' linkage). Each uses observation/experiment (the O'--S' linkage) as the cornerstone of understanding. The 'theoretical foundations' of each are dynamic and evolving. Under this model, the substantive difference between the approaches to consciousness is in the

postulate of what kind of reality contains us: objective, subjective, or detached.

These pretty models may not be entirely accurate, but they do address a synthesis of three dominant ways of looking at consciousness. Surely no one culture is 'correct', thus to come to an actual understanding, models such as Hut's which synthesize are mandatory.

PERSONALLY

For the record, my personal belief is that what occurs in our awareness of mind, particularly the internal words and images we hold as our own, is analogous to the excreta of other cleansing systems of our body. Thought is the waste by-product of consciousness. Consciousness itself is the experience of profound nothingness. This it shares with the matter of the universe, which is also embedded in the profound nothingness of outer space.

Just as physical excrement enriches the soil and contributes nourishment to the health and vitality of the trees growing in it, so then does the excrement of consciousness enrich the ground of abstraction and contribute nourishment to the health and vitality of the tree of knowledge.

After reviewing the content of Tuscon III, I was both comforted and struck by the fact that almost every idea that I had previously come across in philosophy, anthropology, mysticism, psychology, computer science, mathematics, etc., was espoused as a theory of consciousness. When something is everything, it is, of course, nothing in particular at all. Consciousness studies has an element of bogosity: it is a place where anything can get published, where any thinking person has a platform. This is not science, and it does not become a science when every theory under the sun is couched in scientific terms. But the bogosity may be the actuality; perhaps consciousness *is* everything.

I hear that at Tuscon I and II there was an even greater diversity of perspectives. People who actually had deep conscious experiences came; the wonderful human tableau spread out in its full glory. At Tuscon III, science exerted its blinders. Only one participant wore fairy-wings. Tuscon III could have been interesting, it could have been "Toward a Circus of Consciousness".

What I liked most about Tuscon III was that the same people I had admired in reading about consciousness in the 1970s were giving lectures on the same things 20 years later. Tart and Monroe and Gazzaniga and Krippner were there in the flesh, still following the evolving story, and assuring me that I did not need to return to the science of consciousness for another 20 years.