Consciousness beyond Anaesthesia

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SUMMARY
Consciousness is an important marker in the progress of general anaesthesia, the Mind’s final integrator of various awareness states subject to drug depression. Awareness contributes to, but is not the equivalent of, consciousness; in fact, by preserving certain forms of awareness as others are depressed, unconsciousness is stabilized. While the hallmark of good anaesthesia practice includes absence of physical or psychological injury with no mental recall, not all drugs that induce a loss of consciousness are able to block memory-recording. Disregard of this dichotomy may lead to tragedy. In attempting to unravel the relationship between what distinguishes awareness from consciousness and the Mind, neurobiologists have followed brain response circuits evoked by various physical and mental stimuli. These suggest that thought, personality, emotions and even the Mind must be chemically mediated processes. Nevertheless, over millennia, mankind has experienced events that question a purely electrochemical explanation. Now modern data appears to show that consciousness, unsupported by brain function, is possible: not for the first time has yesterday’s supernatural become a new cutting edge for science. New ideas in theories of particle physics concerning the ultimate structure of matter propose extra, unexplored dimensions of existence to provide surprising answers.

Consciousness beyond Anaesthesia

‘Science is the search for explaining new mysteries rather than the cataloguing of old facts and concepts … the scientific challenge is to discuss new hypotheses’

The nature of consciousness

Many billions of years ago, in an inanimate world, the spark of life ignited a new entity. In a premeval sea, a solution of simple water-soluble elements, such as might be found in meteorite dust, became sequestered within a waterproof membrane, thus creating the original cell.

Life embodied certain qualities:
- A self-sustaining chemical process kept in ferment by energy through gas exchange;
- Cell growth, which depends on an ability to assemble chemical building blocks out of the surrounding microcosm, and the memory to reproduce itself;
- To survive, Life must detect and react to environmental changes;
- These first free-form cells, in adapting to their environment, evolved new forms and function, eventually congregating with other cells;
- Mobility was a very early evolutionary advance that enabled more appropriate responses to environmental change;
- Ultimately, the need for survival would lead primitive cell groups to isolate themselves within a controlled watery environment that could host a great cell variety in one organism – life’s first great evolutionary step?

A capacity to respond to environmental change was the first form of Awareness. Since then, Awareness remains an overriding factor in survival. At some stage an extending awareness on many levels became Consciousness. This state must differ in other animals, and indeed there are other types of awareness of which we are not conscious. Much of this has to do with stabilizing the internal environment that was created as a buffer between cells and the outside world. These “subconscious” fields of awareness that control our autonomic systems are also affected by drugs that suppress Consciousness. Full consciousness is built on high degrees of selected awareness, integrated in the brain’s cerebral function. Some people distinguish between consciousness and the Mind, seeing the latter as a distinct brain activity in which resides both the ultimate controls and the unique personality. This involves the construct of our personal identity, of self-expression, the capacity for abstract thought, and of feelings, such as empathy and compassion, as distinct from basic emotions. People baulk at the idea of a controller as part of the controlled. Debate still swirls around the nature of Consciousness, Awareness, the role of the Brain, and its separation from the Mind.

When does awareness expand to the level of consciousness? The anaesthesiologist who regularly leads patients into and out of oblivion may have as much pertinent to say as the philosophers. As the mind re-ascends out of inhaled anaesthesia, the subject passes through a series of discrete awareness levels, from pupillary response to light to recognizing a face, from reflexive through semi-coordinated movement to writing, from slurred speech to coordinated replies, from disorientation in time and place to confidence in reality, from “why am I here?” to “how did it go?” When looking back on such an experience, events will be fuzzy at best; clear memories, accurate in detail and passage of time, are part of full consciousness.

The concept of Consciousness is a major interest for anaesthesiology because one believes that unconsciousness brings forgetfulness of pain; it is a concept like that of God, difficult to prove yet universally accepted. How should we detect it? The problem we overlook is whether, during anaesthesia, with its lost hours of amnesia, there was awareness of a stream of real-time single events that left no record in memory, excepting possibly hidden scars beyond conscious recall. Often during surgery there are responses tonoxious stimuli, manifested by autonomic reflexes, as changing degrees of surgical pain require changing anaesthetic levels. Do these autonomic signals ever break through into a subconscious memory? In fact, delayed responses to such pain do sometimes follow: depression, unreasonable fears and phobias, nightmares and other psychological scars.

Certainly, the possibility of such breakthrough is supported by the work of Levinson. While deep under ether anaesthesia, the “noxious stimulus” first applied to patients “in their hearing” was an urgent discussion of an unexpected, imminent, life-threatening complication. The surgery was for minor “day case” dental procedures. On recovery, no patient could recall their surgery or the discussion, but some did develop new psychological symptoms. Later, after full recovery and under hypnosis, there was recall of the spoken word. Not only was speech detected and its meaning interpreted, but the life-threatening implication thereof was understood. This could be shown to be responsible for the subsequent psychological trauma.

On mechanisms

“Awake and aware of one’s own existence, thoughts, and surroundings” is the dictionary entry and most people’s understanding of consciousness, a concept perhaps so simple that it is argued over by philosophers, theologians, neurophysiologists and others. Awareness involves the collection of data from the environment through the five senses (and a sixth?), based firstly on an inter-
pretation of what is perceived. This outcome is then compared to recalled experiences, pre-learnt response patterns, abstract thoughts, present circumstances and future plans. An appropriate response is finally reached and executed, dependent on one’s “personality” and environs. Many of our basic response patterns are based on “hard wired” instincts that were designed to protect the individual’s life or the species’ survival. One goal in educating children is to modify their instinctual behaviour to suit local mores. But these old responses may still return while one is recovering conscious control after anaesthesia, or during overwhelming sensory overload, just as wounded soldiers ignore severe injury during battle. In other words, learnt behaviour patterns can be overridden.

Consciousness can be modulated in many ways: as during automated or repetitive activities, by meditation, by music, by concentration on a task, by hypnosis, through religious experience, or by mental activities that mix or overload various forms of awareness.

The neural pathways to consciousness, from periphery to brain, are well defined. Almost all sensory experiences from the neck down is gathered by spinal nerves and pre-processed in the spinal cord itself before reaching the brain as episodes of awareness. This processing involves a first sorting of noxious from non-noxious inputs.

Inputs from the head, with its built-in special sensors of smell/taste, sight and sound, bypass the spinal cord to enter “higher” in the sensory pathways. So do the inputs from the autonomic systems: parasympathetic via the vagus trunk, and the sympathetic. The autonomic pre-processing of data, corresponding to that of sensory input in the spinal cord, takes place instead in numerous peripheral ganglia of the sympathetic chain and major visceral ganglia. This very important difference and their control centres in the medulla probably accounts in part for the initial stability of autonomic function during volatile anaesthesia. Ultimately, in very deep levels of anaesthesia, these drugs become tissue poisons, and differences disappear.

In its course to the brain, this main flood of external body sensations gives off branches to the reticular activating system (RAS) in the midbrain to generate therein a persisting activity. However, the destination of this main sensory flow is the midbrain’s thalamic distribution relays. Meanwhile, the output from the RAS leapfrogs past the thalamus to prepare the cerebral hemispheres to process into a conscious image the load of new sensations about to arrive. The induced surge in cellular activity evokes a high blood flow, and creates among the highest metabolic demands of any body organ. Thus the brain is the first to be injured by a lack of oxygen or fuel.

Below the highest cerebral level, pain is first interpreted at the thalamic level, where emotions are generated and memories enter storage. In fact, a level of awareness exists in this middle “reptilian” part of the brain: before the mammals prospered after life’s last near extinction, this was the standard central nervous system (CNS) design. Now it functions as a sort of back-up centre for the complex circuitry of the cerebral hemispheres that is needed for full consciousness.

Thus, information passing from the spinal cord through the midbrain reaches the cerebral cortex to receive and process. Meanwhile, the thalamus has already started data processing with responses. The cortex can be regarded as a later, fine back-up processor for the thalamus.

From the start it was believed that the “traditional” inhalation anaesthetics, “the ethers”, directly depressed activity in the cerebrum. This has now been proven incorrect. In cross-circulation experiments in goats and sheep, the spinal cord has been shown to be up to three times more sensitive to volatile agents than the brain. Through their synaptic blocking ability, volatile agents also affect multisynaptic RAS “reverberating” circuits. As these volatile drugs work at the spinal cord level and reduce RAS activity, they rein in cerebral activity: there’s now a different mechanism for the same effect. Since inhalation anaesthetics act through a primary effect on the spinal cord output, one will see the same effect produced by high spinal anaesthesia, which also induces sleep along with sensory loss. As the spinal block wanes, the patient awakes, warned of the impending return of pain sensation.

There are many drugs that produce unconsciousness by acting on the cerebral cortex that are but poor anaesthetics if they do not block the entry of surgical pain input from the spine. “Pain” starts up the midbrain processor and so produces a “local awareness” that can leave behind unpredictable emotions and memories.

The ideal anaesthetic could be one that prevents any sensing of injury from entering any CNS processing circuits that trigger a spate of responses in all body systems. Where there is data processing there are always memory circuits, followed sometimes by inevitable changes in neural connexions. After is never quite the same as before. Better let sleeping dogs lie.

Of the sensory inputs that bypass the spinal cord, those that are directly connected to the brain, vision and smell effectively are extensions of the brain itself and would seem to fail with consciousness. A light reflex (a primitive protective response in many life forms) does persist into early anaesthesia. Hearing is different; mediated by a dedicated rapid pressure transducer in a specialized organ hooked up to a cranial nerve. This sense remains awake while the brain sleeps. Indeed, as anaesthesia is being induced sound is often magnified. Hearing is a detector of remote activity in total darkness, the universal protector of sleep, not to be forgotten by those near the ear of a sleeping patient.

To understand these complexities of organization, consider a naval vessel. High in the superstructure is the bridge, the commander’s domain, where inputs are received from the eyes and ears, radar and radio, the barometer, weather and the sea, to set a course to steer. Equipment for signalling, attack and defence is directly at hand. Here is the central nervous system; the decision-making area that sets the course.

To keep the ship on course are the folk below decks who keep the engines turning, produce electricity as the common energy source, prepare the fuel/food, keep the air conditioned, water supplied and waste controlled. They are the autonomic partners, either sympathetic or parasympathetic. Knock out the bridge and the ship keeps going until it runs out of fuel or runs aground.

In such a scenario, general anaesthesia would render the captain and his mates unconscious, leaving alone those below decks to keep life going; they represent metabolism, blood circulation, breathing and control of body temperature.

However, this is not the whole story, judging from new and sometimes unconventional evidence. We have described a mammalian model, but has man evolved further? Has the original life property of survival awareness further evolved in humans to self-awareness – an ability to recognize oneself in a mirror and our place in the universe – to a level beyond our conventional consciousness? (The little bird that attacks your rear view mirror is not bent on suicide. This is a self-defence response that, along with self-sacrifice, is a species survival instinct seen in birds and animals.) But now, is it possible that awareness has progressed to a new reality, as the evidence presented below might suggest?

The difference between Awareness and Consciousness

From a narrow anaesthetic application, this probably is best illustrated by the degrees of sensory depression that follow during recovery from an anaesthetic. There will first be a return of reflex movement to painful stimuli, and then to other stimuli as accuracy of sensation improves. Sometimes, as processing returns, there follows a “delirium” phase of excitement with violent defensive behaviour. Then mental confusion gives way to a slow enlarge-
The Mind

The debate continues concerning the nature of Mind, a debate that started well before the 17th century, when it became a focus for two philosophies. The two distinguished protagonists were Spinoza, who regarded the mind as part of the conscious state: “the mind is an idea of the brain”; and Descartes, who believed the mind to be a separate, non-physical entity that communicates through the brain. While both understood that consciousness was bound up in brain function, Descartes’ idea could imply something ethereal or spiritual, the equivalent maybe of the soul. The powerful Catholic Church in his time considered such open debate a dangerous heresy: both continued working in the sanctuary of Holland.

The ongoing present anatomical, pharmacological and neurophysiological research into brain circuits associated with ideas and emotions would favour Spinoza’s concept of an essentially physical mind as the accepted view.

The Mind is chemistry?

If this is so it does not cover scientifically suspect facts such as the telepathic communication used by mediums, by dowsers (in water divining), and in interpersonal unspoken communication between close friends. However, there is an increasing body of scientifically valid data about consciousness that needs consideration. The data comes mainly from three sources:

- Near-death experiences (NDEs);
- Well-controlled experiments with spiritual mediums; and
- Hypnotherapy.

Near-death Experiences (NDE)

Many anaesthesiologists will have known patients who have been resuscitated from a life-threatening situation. And with the increase in ICU care, the “moment of death” is precisely defined by monitors. The experience of patients recovering from NDEs was customarily explained away, until the “moment of death” was monitored during anaesthesia or on the strip chart in the critical care ward. This “brush with afterlife in another world” is not uncommon, yet those who experience it are loath to discuss it: a US Gallup poll in 1981 extracted 51 million responses.

After the ECG and EEG become flat traces, an account of what happened to the “discarded” body is remembered by up to 20% of subjects: the sequence, which follows an age-old pattern common to many cultures, was even reproduced in a painting by Albrecht Dürer. There is remarkably clear recollection only of the critical time while the “consciousness” floats above the “expired” body in an “out-of-body” experience. It ends suddenly on return to the body after resuscitation. There is accurate visual recall of people present, procedures done, speech, sometimes telepathic communication, facts that could never have been registered by a depressed brain. This recall is the more remarkable if a patient was under general anaesthesia; even after a standard anaesthetic, the recall of peri-operative events is at best hazy. Re. recall after NDE can contain crystal clear detail, often expressed by the subjects, of finding themselves suddenly in a totally new “environment”, using cultural idioms with which they are familiar.

Spiritual Mediums

Many spiritual mediums will not submit to the strict controls required for an interaction of subject and medium. Others, of repute, are prepared to work with controls. It has been possible to set up well-controlled experiments in which the medium has never met the sitter, and has no knowledge of their identity – knowing only that the person will be in a separate room decided just before the trial. There may be no verbal or visual contact between the sitter and the medium. The medium then is asked to describe the subject through contact with a passed-on relative. The accuracy of the data received is compared with randomly-acquired data using unsophisticated subjects in the role of mediums. Accuracy is usually near 90%/+ compared to the expected random of 50% or less. Sometimes a sitter has to confirm a fact later, an intimate family detail, of which they were previously unaware. This indicates the persistence of an integrated personality, a consciousness, beyond death, communicating through the medium.

Hypnotherapy

On the principle that certain psychological problems are the scars attached to suppressed memories, hypnotherapy is used to find a cause of a present psychological problem by regression to earlier periods in a patient’s lifetime. Some practitioners (Brian Weiss) have been able to regress patients over their lifetime horizon into past lifetimes, there to uncover long past traumatic events that are responsible for a present psychological problem. Here we go even further into scientifically suspect fields of reincarnation: to the idea that “a consciousness” may move from human frame to human frame, making in, in fact, “immortal”, with links to brains via memory. This coincides with concepts of the soul, or the suggestion that one person’s consciousness is part of a universal consciousness field unrestricted by space/time. Were not many of mankind’s myths grown from a grain of truth?

This is intellectually indigestible material, evidence derived from our human perceptions, gathered worldwide. Perhaps we should go back to the experts and ask Descartes and Spinoza what their final conclusions now might be. Descartes would doubtlessly respond that this really is what he’s been saying for centuries, and that it does not clash with religious doctrine. Spinoza’s more materialistic interests could well refer us to modern quantum mechanics and its particle physics theories that deal with a total, strange subatomic world where matter and energy interact.

One may consider NDEs and new ideas of consciousness in two ways. Firstly, and most significantly, a “personal observation” of an NDE includes the absence of time; communication by thought transfer; total recall of facts; distance being no barrier because of telepathy. All this is suggestive of a brief visit to another space-time dimension, such as that predicted by quantum mechanics theory. A discussion of such ideas by Pim van Lommel has been to find in ‘About the continuity of our consciousness’.

Some analogies may help: the hologram can contain a full three-dimensional image of space in a minute two-dimensional dot. The Internet has no substance, but is rather a field that pervades our world that can be tapped into by any consciousness. Our consciousness is part of the universal infinite field into which our material brains anchor us to one spot in the moving stream of infinity.

Ultimately, quantum theory has now led to the formulation of string theory, the outcome of more than thirty years of inspired development and constant debate. Esoteric ideas are formulated in the secret, in the cabalistic language of higher mathematics, understood by a select few whom Bhaumik characterises as the new priesthood of new mysteries. To ordinary people the theory is impenetrable, an almost unnatural way of thinking about the world. One hesitates to attempt any partial explanation, even though the conclusions are relevant.

Like much else in this field, the idea has its roots in Einstein’s equation, $E=mc^2$, which states that matter and energy are interchangeable and that energy and mass are interconvertible in the infinitesimal small states described by quantum mechanics. At the beginning of our universe there was an infinite density, infinite small bundle of energy that destabilized into “The Big Bang”, unleashing rapid expansion of plasma and incredible heat. After three hundred thousand years, the temperature in the universe had fallen to 3000 °C and, for the first time, light could penetrate. As was shown by Hubble years ago, our universe is still expanding, microwaves show the temperature “out there” has now fallen to 3 ° above absolute zero. Much of the original energy has been converted to matter in the galaxies and interspace of the cosmos. All matter
is governed by the invisible force fields of four fixed laws that pervade the whole cosmos: the weakest is Gravity, which ties our planets to the sun and us to our world, mediated by gravitrons; there is Electromagnetic Radiation and its photons, which we detect as heat, light and radio waves; there are the Strong and Weak Forces, a pair that regulates the structure and breakdown of atoms into ever smaller particles that operate over the tiny distances covered by quantum mechanics; despite unimaginably small distances they are incredibly potent, as shown when the atom bomb was released.

String theories were developed to unify these four laws of physics, covering from very large bodies (light years) to very small subatomic particles (10^{-13} cm of the Planck unit of quantum mechanics). At such incredibly small dimensions, proof positive for these theories is not experimentally possible, therefore researchers resort to experimental modelling in the secret language of higher mathematics, a language which is understood by the few who have devoted lifetimes to unravelling these mysteries. The results have been interesting and disputed. The present proposal is that all matter is composed of immeasurably small strings of oscillating energy making up subatomic particles, the complexity of string oscillation defines the nature of matter. These strings may be open ended, closed like a donut, or with ends fixed to a common "horizon", of which there may be a variety.

This is, of course, all conjecture, but the theory seems to resolve many of currently relevant constraints to integrating the four laws of matter. Applying string theory yields an apparently inconceivable conclusion that there exist far more than the four dimensions we live in: space + time. Figures vary from 10 or 11 to over 20 dimensions. Time, being non-material, need not be included as a dimension. Present string theory offers us at least three or four sets of extra three-dimensional planes to be added to our present home. One concept is that such three-dimensional worlds, each tethered to a "brane", could be aligned parallel with each other so that we could, in fact, be "surrounded by a cloud of invisible witnesses" unless we can escape into another brane. Theory has not told us bow to cross.

String theory has great enthusiasts and critics; some call it twenty-first century science in the twentieth century. It offers by far the best range of explanations ever in this branch of physics and is therefore included for serious consideration.

And the implications are far reaching it could mean that we are surrounded by a host of invisible beings, among whom is our guardian angel. Consistent in an account of NDE by survivors is that there is no sense of time, that ideas are exchanged by thought alone, without speech. By thought you can move where you will: distance is not relevant without time. Might spiritual mediums be born with a conscious connexion to their soul's origin in another dimension and the ability to move across the barrier between dimensions? Does a visiting "spirit" overcome the "inter-brane" barrier to manifest to us as a spectre by taking energy from adjacent air to produce light, thereby chilling the surroundings? One hears echoes of ideas from mankind's early beginnings retuned by string theory. Should one try to think beyond our inbuilt material concepts of our world to find the source of our elusive Consciousness?

As a final thought, since the lodestone of quantum theory seems to be that tiny unit string of energy upon which galaxies are built from atoms up: will theory find the path beyond matter to pure immaterial energy, indestructible, infinite, to the great original spirit? SAJAA

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