

# NEURO-ONTOLOGICAL INTERPRETATION OF SPIRITUAL EXPERIENCES<sup>\*,\*\*</sup>

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## A SPIRITUÁLIS ÉLMÉNYEK NEURO-ONTOLOGIAI ÉRTELMEZÉSE

A központi idegrendszer funkcionális szerveződése hierarchikus elvet követ, amely lefelé haladva nem ér véget a neuroaxonális szintnél, hanem kiterjed a szubneurális elemekre is. Amikor az információátvitel alegységeinek nagysága nanométerekben mérhető, és elemszámuk meghaladja a neuroaxonálisét, akkor egy új minőség jelenhet meg az információfeldolgozásban és ez feltehetőleg mikrofizikai hatások érvényesülése kvantum-komputáció keretében. A kvantum-sajátosságok közül, elsősorban a „szignál nonlokálitás” az, ami releváns lehet az információfelvétel mély szintjén, és amelynek segítségével a módosult tudatállapotok egyes jelenségei értelmezhetővé válnak.

Az antropológiai megfigyelésekből és spirituális tradíciókból ismert rituális gyógyítás számos olyan elemet tartalmaz, ami jelenlegi felfogásunkból nem interpretálható, de egy új modell keretében értelmezhető. Ez a modell a hétköznapi tudatállapotra jellemző „perceptuális-kognitív-szimbolikus” megismerés mellé egy, a szignál nonlokálitáson alapuló „direkt-intuitív-nonlokális” információfelvételt rendel. Az utóbbi spirituális élményekben és a módosult tudatállapotok integratív formájában érvényesülne. Az integratív forma az, amit a rituális gyógyítás alkalmaz, és elkülönül a módosult tudatállapotok dezintegratív formájától (pl. pszichózis, delírium). A kultúrkörünkben szokatlan rítusok közvetett célja a „profán” szenzibilitás (modellünk szerint a „perceptuális-kognitív-szimbolikus” megismerés) letörése, amelyet ritmikus ingerlés-

sel-mozgással, kimerítő fizikai stressz-hatásokkal, és esetenként hallucinogén szereket használatával érnek el. Az így bekövetkező módosult tudatállapot tradicionális közegben integratív jellegű, utat nyit a „direkt-intuitív-nonlokális” információfeldolgozás felé, de rituális kontextustól leválasztva, kultúridegen környezetben, rekreációs céllal indukáltan spirituális tartalmát elveszti és könnyen dezintegratívvá válik.

**KULCSSZAVAK:** módosult tudatállapotok – gondolkodás – sejtíváz – dimetiltriptamin – etnofarmakológia – hallucinogén anyagok – rituális gyógyítás

## SUMMARY

The prevailing neuroscientific paradigm considers information processing within the central nervous system as occurring through hierarchically organized and interconnected neural networks. The hierarchy of neural networks doesn't end at the neuroaxonal level; it incorporates sub-cellular mechanisms as well. When the size of the hierarchical components reaches the nanometer range and the number of elements exceeds that of the neuroaxonal system, an interface emerges for a possible transition between neurochemical and quantum physical events. "Signal nonlocality", accessed by means of quantum entanglement is an essential feature of the quantum physical domain. The presented interface may imply that some manifestations of altered states of consciousness, unconscious/conscious shifts have quantum origin with significant psychosomatic implications.

\* In memoriam Imre Susits

\*\* The authors will expand the presented concepts with more details addressing the general public in a book entitled *Inner Paths to Outer Space*, which is planned to be published in 2007.

Healing methods based on altered states of consciousness and common in spiritual or shamanic traditions escape neuroscientific explanations based on classical cognition denoted here as “perceptual-cognitive-symbolic” (characteristic of ordinary states of consciousness). Another channel of information processing, called “direct-intuitive-nonlocal” (characteristic of non-ordinary states of consciousness) is required to be introduced for interpretation. The first one is capable of modeling via symbolism and is more culturally bound due to its psycholinguistic features. The second channel lacks the symbolic mediation, therefore it has more transcultural similarity and practically ineffable for the first one, though culture specific transliteration may occur.

Different traditional healing rituals pursue the same end: to destroy “profane” sensibility. The ritual use of hallucinogens, the monotonous drumming, the repeated refrains, the fatigue, the fasting, the dancing and so forth, create a sensory condition which is wide open to the so-called

“supernatural”. According to contemporary anthropological views, the breakdown of ordinary sensibility/cognition is not the ultimate goal, but the way to accomplish healing, that is psycho-integration in the widest sense. From the perspective of system theory, integration needs information to be brought into the system. According to the presented model, when the coping capability of the “perceptual-cognitive-symbolic” processing is exhausted in a stressful, unmanageable situation, or its influence is eliminated by the use of hallucinogens or in case of transcendental meditation, a frame shift occurs, and the “spiritual universe” opens up through the “direct-intuitive-nonlocal” channel. There is little chance either for a psychointegrative effect, or for a meaningful „opening“ without ritual context, and with the recreational use of mind altering strategies.

**KEYWORDS:** altered states of consciousness – cognition – cytoskeleton – dimethyltryptamine – ethnopharmacology – hallucinogenic agents – ritual healing

*Motto: “Not facing the irrational is not rational (i.e., irrational).”*

## Introduction

Ideas loosely connected under the concept of “spirituality” have been gaining increasing popularity and acceptance in the wide public. Spiritual issues spill over New Age literature and appear in journals of academic interest (Emmons 2003). Facing the phenomenon “hard core” scientists are left with two options at the first bifurcation of the decision tree: to ignore it, or not to ignore it. The latter branch takes to the choice between debunking it, or not. This article takes effort to follow a sympathetic approach. However, it will be seen that for understanding and rationalizing spiritual claims one has to leave the safe ground of mainstream science and enter uncharted areas following a slippery path.

The first question to answer can be formulated this way: why does the idea of soul, spirit, or rebirth echo across ages, why do these concepts appear and reappear in widely different cultures. The belief in spiritual forces and other worldly realms appears universal in the human species. Rational thinking deems such concepts superstitious, origi-

nating in illusion or fear of death, representing anxiety over ego-dissolution, and considers them products of wishful thinking. Academical accounts see spiritual practice arising from the functioning of the human mind with its supposed tendency to seek spiritual states, or comfort in a hostile world (Lewis-Williams and Pearce 2005). Accordingly, in worshipping spiritual beings humans are just paying homage to a rarified form of themselves.

One can see that certain beliefs and experiences universally crop up in spiritual practices around the world and maintained for millennia. The empirically established existence of resilient commonalities is remarkable. Regardless, the fact that spiritual teachings and mystical wisdom traditions share a remarkable cross-cultural similarity can be dismissed with a skeptical shrug: and explained away as projections of intrapsychic structures common in every human being, and that misinterpretation of universal experiences like dreams may lead to the belief in existence of spiritual beings (Tyler 1987). There are some elaborate explanations drawing parallels with a pathological condition. Similarly to schizophrenia, which – as some speculates – is a price the human race pays for the gift of language (Crow 1997), the

tendency to believe in “supernatural” beings is common in all humans, because it is an offspring of creative imagination. That is, something maladaptive resides in us universally and stays with us persistently, because it is closely tied to an adaptive trait; that is creativity in present case. The most permissive, dispassionate scientific approach accepts universality to be sufficient for establishing phenomenological reality, but leaves the question open to its ontological source (Winkelman 2004).

Skepticism has a very high value in Western scientific thinking. It ought to be that way to keep knowledge-building tightly disciplined. Then why not use skepticism in a self-referential way, from a self-critical point of view? First of all, we must be skeptical toward our own cultural background, which has many hidden presumptions governing even the supposedly objective way of answering questions. Setting boundaries is the essence of the scientific method when it isolates things, separates systems in order to study them experimentally without confounding interferences from the outside. Where is then the boundary of the scientific method itself? If science has limitations, then it cannot be the bearer of the ultimate truth. Overvaluation of science, such as scientism, can take the form of cultural arrogance when it attempts to explain why people of different cultures do things the way they do, interpreting these costumes, rituals while ignoring their own reasons behind what they are doing. The issue is not about cultural relativism; the authors do not fall for it, just call attention for respecting the opinion of aboriginal cultures and will use their interpretation as a starting point of the presented one.

### Cognitive Schemas

First, let us see how sound Western confidence in scientism really is. The basic concepts science holds about the human phenomenon can be summarized as outlined below:

“Man is the byproduct of mere chance.”

This follows from the combination of evolution theory with random genetic mutations. There is no Divine Plan, no Almighty Creator. From the chaotic movements of the material world, complex systems evolved as a result of chance, so chosen by natural selection.

“We live in a Universe alien to us and ignorant to our destiny.”

The Anthropic Principle, neither in the “soft” nor in the “strong” form comes for the rescue of the individual person. It states that the physical constants of our Universe predispose it to be hospitable for human life, but the Cosmos is absolutely indifferent toward the fate of one member of the species.

“We have come from nothingness and will return to nothingness after death.”

This is the decree of “dust to dust”. Only the most basic components of our bodies will survive and continue the big circle of life.

It is apparent to a mind trained in behavioral sciences that the above statements are strikingly similar to the Beck triad. The psychiatrist Aaron Beck noticed the cognitive distortion of depressed subjects about self, world, and the future, calling it the negative cognitive schema of depressive thinking. Derogatory views of the self, the world, and of the future are core features of the depressed individual:

“I am a worthless person.”

“The world is an unfriendly place.”

“My past is a tragedy, my future is catastrophic.”

Beck suggested that depressed people draw illogical conclusions about situations, and these lead to a distortion of reality, which manifests in the magnification of negative experiences, and trivialization of neutral or positive ones. The cognitive triad is the source of the extremely low self-esteem of depressed subjects; it can lead to micromanic delusions, manifesting as psychosis in the extreme form.

The parallel between the theses of scientism and the Beck triad is close, and raises the following questions. Does the same conclusion stand for scientific thinking as well? Is the latter illogical, or biased in worldview similar to that of a depressed patient? Of course not. Science is not illogical, but it may suffer from overexclusiveness. It must be biased in that direction in order to build rigorously a consistent, knowledge system by keeping “soft”, poorly validated concepts outside of its domain. Nevertheless, what lies outside of the semantic universe of “official science” today, may be part of it tomorrow. There are more things in Heaven or Earth than are dreamt of in our current philosophy... Can the negative thinking of Western rationalism lead to a pathologically flawed underestimation of the human potential akin to a psychotic depressive delusion? A possible answer is hidden in the cognitive schemas of seven wisdom tradi-

tions, schemas which can be designated as unambiguously positive:

Jesus: “The kingdom of Heaven is within (or among) you.”

Islam: “Those who know themselves know their Lord.”

Judaism: “He is in all, and all is in Him.”

Confucianism: “Those who know their own nature, know Heaven.”

Taoism: “In the depths of the soul, one sees the Divine, the One.”

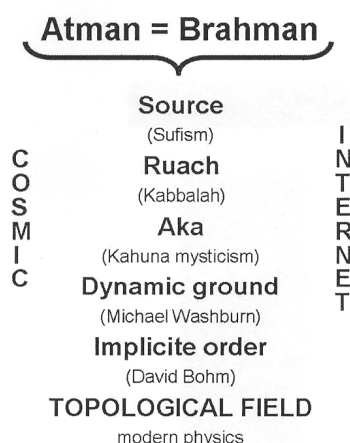
Buddhism: “Look within, you are the Buddha.” (Walsh 1991)

Apparently, the issue is about self-knowledge. However, it is not about the self-knowledge favored by Western individualism. Individualism is a cultural tradition of the last 200 years, and has been nurtured in the West. The cited wisdom traditions are at least 1400 years old, and all of them were born in the East. The seventh statement formulates most concisely the essence of all of them:

Hinduism: “Atman (individual consciousness) and Brahman (universal consciousness) are one.”

In other words, if you descend into the depth of your psyche you will arrive at something common in you and in everything. One discovers this by consistently looking inward until “within” becomes “beyond”. In the other direction, if you look far and deep into the universe and dare to go beyond, at some point you will face your self. There is no such thing as monotonous, infinite progression and regression with endless hierarchies, larger and larger supersystems on the way up, or smaller and smaller elementary particles on the way down. Quantum physicists have already stumbled onto the problem of conscious observer, and were able to find a way around it in the Copenhagen interpretation of quantum mechanics. The great unification, the Theory of Everything, very likely requires better understanding of consciousness as the vehicle through which all things are known. As physicists struggle to tie together relativity and quantum field theory in terms of quantum gravity, perhaps further insights will be obtained from understanding the nature of logic, cognition, and consciousness. The inside and outside paths will eventually converge in consciousness; or in what is known as *Source* in Sufism, *Ruach* in the Kabbalah, *aka* in Kahuna mysticism, *dynamic ground* in transpersonal psychology, and is called as *topological field* by heterodox physicists (Table 1). Popular views may recognize it as

Table 1  
The most important revelation



the Matrix, the Cosmic Internet. At the deepest level of our psyche, at the bottom of our soul, we become one with the ultimate reality. Any, even the last, most unfortunate member of the human species carries the whole Cosmos inside and has the potential to reach it, to tap into it. This is exactly what one may realize as the most positive scheme, the most important discovery of all times.

Sounds good. This kind of teaching definitely soothes the soul. It would be interesting to find out whether the prevalence of clinical depression, anxiety disorders, and suicidal behavior is lower in cultures nurturing these teachings. Regardless of their positive impact on everyday life, doubts remain: Does spiritual wisdom represent wishful thinking? Does it have scientific meaning at all? Does it have a place in our world view at the beginning of the 21st century?

Then, why are no less than seven wisdom traditions so unequivocal in their basic tenets? Why do two mystics separated by two millennia and two continents get better accord on these issues than two scientists of the modern era on the nature of Universe?

Foolish, arbitrary thinking can hardly reach this degree of consensus. Ken Wilber (2001) said – not without some sarcasm: “Eighty three hallucinating schizophrenics couldn’t organize a trip to the bathroom, let alone Japanese Zen”. Wilber referred to the eighty three followers of Zen Master Hakuin as sages with mystical experiences and not schizophrenic subjects with perceptual distortions. The historically new rational thinking, the triumph of the era of Enlightenment, is an outlier of the wisdom tradition, and definitely not the enlightened one. If the sages are right about mystical enlightenment, their truth must also be correct

in the framework of another knowledge system – Western science. The problem is to find a proper way of translation.

The purpose of this essay is to answer the above questions in a scientific – well, some critics may say pseudoscientific – way, and will attempt to cross-over between the concepts of different worldviews. These authors are fully aware of the pitfalls of both overinclusiveness and passionate thinking. Truly, the underlying methodological approach has minimal experimental support; it can rely only on neurophenomenology, model-making, searching for inconsistencies in rivaling views, and using of the dubious power of converging evidence.

### **Spiritual Dimension and the Extended Biopsychosocial Paradigm**

As an anchoring point and clarification here is a definition of spirituality: “something that I may not perceive, but others can; and this kind of experience enriches them.” This is a relatively cautious approach; even people with an aversion toward New Age, esoteric thinking may accept it. The Institute of Noetic Sciences found in a survey that about 75% of the population had at least one spiritual experience in life, but 75% of individuals employed in the healthcare and those with strong academic background had not. The revealed divergence calls for a second study to replicate these results and has to be a wake-up call for professionals.

Contemporary medicine defines human beings in a biopsychosocial framework. The concept of patients as biopsychosocial entities goes back to George Engel (1977), and comes from the observation that there are ailments which cannot be treated successfully by biological means only. There also are mental disturbances where targeting the intrapsychic conflicts only (e.g., in classical psychoanalysis) is not enough – the therapist must address the subject’s interpersonal relationships as well (e.g., in the form of family therapy). Involving higher levels of the biopsychosocial pyramid in healthcare may result in permanent improvement, and palliative therapy can be replaced by curative treatment.

The Engelian biopsychosocial paradigm is not complete. Something is missing from the top that

would provide for a transformation into a mighty pyramid. That is the All-Seeing Eye, the symbol of spirituality. There are anthropological observations, Oriental descriptions, and Western anecdotal reports about successful therapies incorporating spiritual elements. One must realize that the top is unsteady without solid layers at its base. The pyramid is just an impressive pile of rock without a radiant capstone at the top. On one hand, a treatment should not be based solely on spiritual techniques in most of the cases; on the other hand, treatments with somatic focus are mostly palliative in Western medicine.

Herewith, we arrived at a modified, extended paradigm: the biopsychosociospiritual model. Therapy *sui generis* is reintegration *in toto* on biological, mental, social and spiritual levels. Thus far, there is nothing mystical in adding the “spiritual” to the concept: moving from left to right along the awkward term means that the individual identifies gradually with higher realms of reality: with the psyche, with the community, and at the end with an entity above community (i.e., environment, nature, Universe, Mother Earth, or other deities depending on culturally canonized worldviews). Meaning emerges from context; more purpose can be acquired from higher hierarchical perspectives. Consequently, spiritual orientation can provide a more meaningful life to individuals than by solely pursuing materialistic goals.

The term “sacred” refers to a sense of respect for and humility toward the larger entities we are subordinated to, and what govern our lives. Based on the illusion that we are in command of our destiny, Western individualism has eroded this concept. The historical process of individualization and alienation involves slicing off components of the biopsychosociospiritual unity step by step from right to left; a process which began millennia ago by gradual separation from nature, by the suppression of tribal ritual traditions. This continued during modernization by destruction of rural communities, then the nuclear family, and has culminated in postmodern emotionless professionalism. The richness of the biopsychosociospiritual model of traditional societies got boiled down to the bony *biorobot rationalis* skeleton of postmodern man.

**Levels of Organization Relevant to Consciousness**

Due to the broad array of contradictory concepts, it is beyond the scope of this paper to address contemporary views on consciousness and to go into details about the emergence of the phenomenon. For a quick overview Table 2 summarizes the levels of organization supposedly involved in generation of the conscious experience. Since the topic of consciousness is mostly ignored by mainstream neuroscience, it is difficult to determine the opinion of prominent brain researchers. The department chairman of the first author once warned him: “If you want to make a career, you must avoid studying consciousness.” Despite some positive trends in other disciplines, orthodox neuroscientists avoid the issue, and unorthodox ones use the politically correct term “awareness” when preparing their grant proposals. Nevertheless, with the exception of the levels at the very top and at the very bottom, most neuroscientists would not disagree with the assumption that all these levels represented in Table 2 are involved in the process.

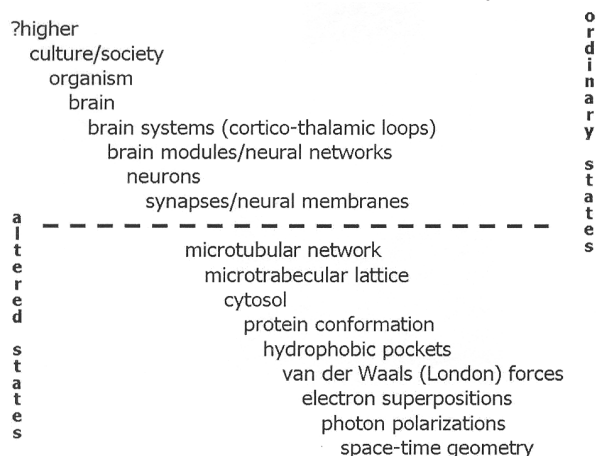
Since no experimental data can be introduced in its support, this hypothesis is as much as anything strengthened by pointing out inconsistencies within the current neuroscientific concepts. Again, this is not easy because one rarely hears established neuroscientists expressing their views on consciousness. If they do, they emphasize the neurological correlates of consciousness as did Francis Crick (1995), who spelled out his radical reductionistic vision as follows:

“You, your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules. As Lewis Carroll’s Alice might have phrased it, “You’re nothing but a pack of neurons”.”

Science writer John Horgan (2000) criticized such narrow views:

“In a sense, Crick is right. We are nothing but a pack of neurons. At the same time, neuroscience has so far proved to be oddly unsatisfactory. Explaining the mind in terms of neurons has not yielded much more insight or benefit than explaining the mind in terms of quarks and electrons. There are many alternative reductionisms. We are nothing but a pack of idiosyncratic genes. We are nothing but a pack of adap-

*Table 2  
Levels of organizations relevant to the conscious experience*



tations sculpted by natural selection. We are nothing but a pack of computational devices dedicated to different tasks. We are nothing but a pack of sexual neuroses. These proclamations, like Crick’s, are all defensible, and they are all inadequate.”

To avoid the trap of radical reductionism, one must assume that all levels are at work with bi-directional inter-related causative processes. Let us pay attention to the position of the dashed line in Table 2. One may call it the “knowledge horizon” since it divides levels based upon their assumed causational role in generating the conscious experience. According to the theory of the neurological correlates of consciousness, the neuroaxonal system has a pivotal role both in the emergence of conscious experience and in the function of levels above it. In his book, *The Blank Slate: The Modern Denial of Human Nature*, Steven Pinker (2003) writes, “culture is crucial, but culture could not exist without mental faculties that allow humans to create and learn culture to begin with.”

The effect of culture in shaping brain structure and neuroaxonal function is also permitted. This means that bottom-up and top-down interactions are at work above the dashed line, and every level has an active role. This is not supposed to be the case below it: the assumption here is that sub-cellular levels are passive, subserving higher levels by permitting, but not shaping their function. Here the causation operates in a narrow way and only from bottom-up, but the role of top-down effects is not believed to operate at this level in mainstream neuroscientific thinking. Above the horizontal line there is a well-balanced “coopera-

tive hierarchy”, below it “oligarchy” is the rule. Of course, this is an arbitrary delineation with broken symmetry. For improved integrity one may postulate that subcellular systems add to the experience something which is a characteristic of their level. They can also shape consciousness. Since the size of the subneural component is close to quantum physical measures, the suggested characteristic subcellular levels add to consciousness is their connection to quantum reality, or “quantum weirdness” – some physicists like to say. The most outstanding case of “quantum weirdness” is “non-locality”, more specifically “signal nonlocality”.

### The End of Local Realism

The most unusual feature of quantum reality is its independence of space-time constraints of classical physics, which assume local realism and local causality. Local realism is a combination of two intuitive notions: 1) the “locality principle” stating that physical effects have a finite propagation speed; 2) the “reality principle”, which means that particle attributes have definite values independent of the act of observation. The Einstein-Podolsky-Rosen (EPR) paradox was first in formulating the following problem: the laws of quantum mechanics are not consistent with the assumptions of local realism. Based on the EPR paradox, Albert Einstein et al. (1935) suggested that the theory of quantum mechanics was incomplete. John Bell’s (1964) theorem indicated that local realism requires invariants that are not present in quantum mechanics, and implied that quantum mechanics cannot satisfy local realism. Bell test experiments (Aspect et al. 1982; Wheeler 1984) provided overwhelming empirical evidence against local realism and demonstrated that under special circumstances „spooky action at a distance“ (words of Albert Einstein) does in fact occur.

Different interpretations of quantum mechanics reject different components of local realism. In one interpretation local realism is broken down due to the “principle of nonlocality”, which posits that distant objects can have direct, instantaneous influence on one another. The nonlocality principle derives from quantum entanglement: a set of particles that have interacted as parts of the same quantum system maintain their interaction after separation regardless of space and time constraints. To put it simply and anthropomorphically:

entangled systems “sense” each other without space and time limitations.

While the theory of quantum mechanics has perfect internal consistency and strong predictive power, it has weak external consistency compared to other realms of current knowledge. Nevertheless, it maintains consistency with the theory of relativity. With the help of “Heisenberg’s uncertainty principle” the theory of relativity is not violated by nonlocal actions since some vital information is scrambled during the process. Information can be transmitted nonlocally, but no one can control the information in advance: bidirectional information exchange with superluminal (faster than light) speed does not occur. Therefore, lack of local realism does not lead to what could be referred to as „spooky communication at a distance“.

Some interpreters – and not necessarily the naïve ones, or those with New Age bent – of contemporary physics suggest that nonlocality is not an esoteric idea. On the contrary it is a very realistic one. According to them, nonlocality is actually the basic principle of the Universe, meaning that the whole Universe is an interconnected, entangled totality. Based on this view, consciousness is inherently nonlocal as well. This fundamental nonlocality of Mind and Universe collapses in the ordinary state of consciousness. Space and time are themselves manifestations of this breakdown, and with them the separated array of particles that dominate large areas of the universe. In this interpretation individual consciousness arises from the interplay of Mind – developing within the nonlocal aspect of the Universe – with matter, which is the localized aspect of this same Universe. Then where in the brain this interplay does occur? What part of the brain serves as an interface between nonlocal and local processes, between the Mind and the material Universe?

### The Quantum Array Antenna of the Brain

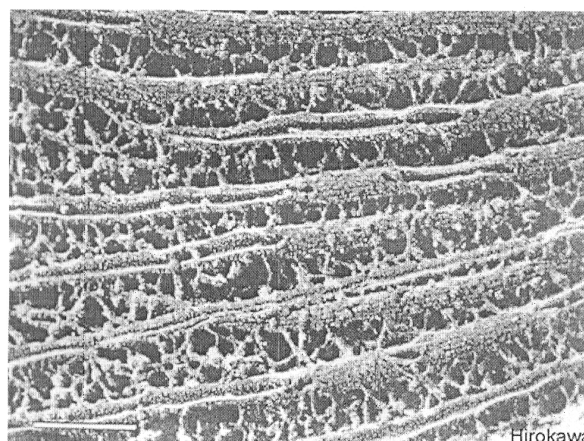
After the development of quantum mechanics many physicists, and subsequently other scientists and non-scientist popularizers, were caught up in the excited belief that quantum theory might explain the mystery of consciousness. There exists a precise correspondence between physical reality and logic since according to the laws of matrix logic (Stern 1988) those are two aspects of the same thing. The striking similarities between the

general quantum and the thought processes gave rise to the quantum hypothesis of the mind. Discovery of quantum computation added another impetus, and dozens of brain models were developed based on quantum computational principles. Among them, the most elaborated is the Penrose-Hameroff model (Penrose 1996). Perhaps not the entirely correct or the ultimate one. Nevertheless, the strength of our concept is not tied to the validity of one model, but to the argumentation outlined in the preceding paragraphs for avoiding the trap of radical reductionism.

Roger Penrose and Stuart Hameroff proposed that consciousness emerges from biophysical processes acting at the subcellular level involving cytoskeletal structures. In their model, consciousness is attributed to quantum computation in cytoskeletal proteins organized into a network of microtubules within the brain's neurons. The cytoskeleton is dynamic „scaffolding“, a network of tubes and filaments providing both structural support and means of transportation of subcellular materials in the cell. While the cytoskeleton has traditionally been associated with purely structural functions, recent evidence has revealed that it is involved in signaling and information processing as well. The microtubules' periodic lattice structure (Figure 1) seems ideally suited to molecular-scale computation and possibly the source of the amazing feats of unicellular protozoa. These tiny one-celled organisms swim, learn, get around objects, avoid predators, and find food and mates – all without the benefit of a nervous system. In multicellular organisms microtubules are connected to each other structurally by protein links, and functionally by gap junctions, self-assembling into a nanoscale network far vaster than the neuroaxonal system. The human brain has about  $10^{11}$  neurons and  $10^{18}$  microtubule units (tubulins). The dimensions of the neuronal cell-body are measured in micrometers and the diameter of the microtubules in nanometers. Microtubules interact with other cell structures, mechanically with the aid of proteins, chemically by ions and “second-messenger” signals, and electrically by voltage fields. In the brain they organize synaptic connections, and regulate synaptic activity responsible for memory and learning.

The microtubular network – with 10,000,000 times more elements than neurons and with a component size close to the quantum physical realm – is a reasonable candidate for quantum

Figure 1  
The periodic lattice of the microtubular system  
(from Stuart Hameroff)

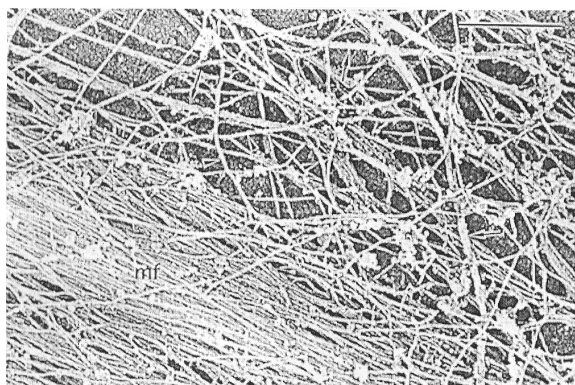


computation and nonlocal information processing. ‘Signal nonlocality’ is the recent buzzword. Just as special relativity is a limiting case of general relativity, so is classical quantum mechanics with signal locality a limiting case of post-quantum theory with signal nonlocality (Sarfatti 2005). The latter is exactly what is implicit in the microtubule model of quantum consciousness and may help us understand, tentatively, what may happen in the spiritual state of consciousness.

One may notice that despite their impressive delicateness, microtubules may be too coarse-grained to explain the emergence of consciousness – of who we really are. In fact, microtubules do not form the finest texture of subcellular organization. Even smaller and more subtle structures branch and interconnect in networks which comprise an “infoplasm”, the basic substance of living material (Hameroff 1987). The most delicate cytoskeletal system is the microtrabecular lattice, a web of microfilaments (biofibers) 4-5nm in diameter. This represents the current microfrontier, the “ground floor” of living material organization. If the periodic lattice of microtubules forms a network within a network of neurons, then the microtrabecular lattice is a network embedded in a network of the cytoskeleton (Figure 2)!

A biological model of information processing is proposed in which the microtrabecular lattice is a medium of quantum holography. Cytoskeletal systems fulfill multiple tasks in the experiences of the human mind: they can influence learning at the macro level, shape consciousness at the micro level, and the authors believe that the microtrabecular lattice network is probably immense enough to contain holographic information about the

Figure 2. The embedded microtrabecular lattice of the cytoskeleton (mf: microfilaments; arrow: microtubule) (from Stuart Hameroff)



whole Universe via nonlocal interactions. The Universe replicates or one may say “emulates” itself within the brain’s structure. In this model, the action of mind is not restricted to the brain, but extends to the whole Cosmos: Mind breaks out of the skull.

If the brain truly contains the whole Cosmos like a hologram, then the perennial wisdom of “As above, so below”, “The kingdom of Heaven is within you”, or “Look within, you are the Buddha” obtains a fresh perspective, and there is hope for their integration into Western rational thinking. Cytoskeletal matrix can be the mediator of the Jungian “collective unconscious”, and cytoskeletal quantum holography can explain a very common but obscure phenomenon known as “intuition”.

### The Direct-Intuitive-Nonlocal Mind: A Second Foundation of Knowledge?

Shamanic and other spiritual practices based on the integrative forms of altered states of consciousness (ASCs) – an integrative ASC leads to healing in contrast to a disintegrative one such as psychosis or drunkenness – seem to elude neuroscientific explanations based on classical cognition. Classical cognition can be conceptualized as a “perceptual-cognitive-symbolic” way of information processing characteristic of ordinary states of consciousness. This is to be contrasted with another mode of information processing, based on nonlocal connections denoted here as “direct-intuitive-nonlocal”.

The “perceptual-cognitive-symbolic” mode is neuroaxonally based, relies on sensory perception, cognitive processing, and symbolic (visual, verbal, logical language) mediation. This form of

information processing is an indirect way of achieving knowledge compared to the “direct-intuitive-nonlocal” method. In accordance with the indirect nature of its processing, this mode splits the world into subject and object, and then performs modeling. Its linguistic feature makes this mode culturally bound. The “perceptual-cognitive-symbolic” method of information processing has been evolved evolutionally for the purpose of task solving, represents a “coping machine” at work, and reaches its peak in Western scientific thinking.

The introduction of a “direct-intuitive-nonlocal” channel is necessary for an ontological interpretation of integrative ASCs (non-ordinary states of consciousness), such as the shamanic trance. Supposedly, this mode of accessing knowledge is based on cytoskeletal functions, provides direct experience (no subject-object split), and is not bound by language or other symbols. Since the “direct-intuitive-nonlocal” channel lacks symbolic-linguistic mediation, it has universal characteristics, shows more transcultural similarity, practically ineffable, although culture-specific interpretations exist. This may be why mystics get better agreement comparing their “data” than do materialistic scientists.

David Lewis-William and David Pearce write in their book entitled *Inside the Neolithic Mind* (pp. 50): “In altered states of consciousness the nervous system itself becomes a “sixth sense”...” We can but agree adding that it is the cytoskeletal system which acts as a “sixth sense”. Understandably, the above authors navigate to calm waters of more traditional concepts continuing this way: “...that produces a variety of images including entoptic phenomena. The brain attempts to recognize, or decode, these *meaningless* (added by us for sake of explicitness) forms as it does with impressions supplied by the nervous system in a normal state of consciousness.” No doubt, they are right, like most of the authors who emphasize the “made-up” quality of ASCs. We are not arguing here for the ontological validation of *every* experience in ASCs, but for those few, very informative ones in integrative ASCs.

The “direct-intuitive-nonlocal” perception of the world also needs rigorous training for its highest development – common in all fields. It takes decades to train an indigenous shaman because the “direct-intuitive-nonlocal” route into the realm of “non-ordinary” consciousness is seemingly capri-

scious, its denizens are so unpredictable, and our “perceptual-cognitive-symbolic” mind is so unprepared, being incapable of distinguishing between what is personal and what is impersonal. What can be nourished, that can be atrophied as well; the latter might have happened in Western civilization and the “direct-intuitive-nonlocal” channel has become “The Forgotten Knowledge”.

The “perceptual-cognitive-symbolic” foundation of knowledge is a result of the brain’s interactions with the local aspects of the Universe. The “direct-intuitive-nonlocal” perception of the world derives from the “nonlocal” features of the Cosmos. In other words: the local Universe of the classical, Newtonian worldview is the reality of our ordinary consciousness, based on the “perceptual-cognitive-symbolic” process. On the other hand, the Mind’s interfacing with the nonlocal Universe (revealed by modern physics) generates the reality of the “nonordinary” states, which are more readily (but not exclusively) accessible in integrative ASCs.

Besides stratification of reality – according to different states of consciousness, another intriguing and corollary these hypotheses is that intuition becomes a valid – although mostly faint in the untrained – source of information. That is, intuition now can be liberated from being some offshoot of a multimodal, parallel-processing function of the “perceptual-cognitive-symbolic” mode.

The outlined dualism of human knowledge resembles to Julian Jaynes’ (2000) “bicameral mind”, but these authors are not concerned as much about a left-right hemispheric distribution of work, but rather about an up-down division between neural and cytoskeletal function. The presented dualistic nature of information processing carries consequences for artificial intelligence research: there are efforts to model the “perceptual-cognitive-symbolic” mode, but what about the “direct-intuitive-nonlocal” one? Where is the technology for creating a holograph of the Universe, a “machine with soul”, a computer capable of accessing the spiritual?

### Hallucinogens as Keys to Nonlocal Realms?

Finally, after these arduous paragraphs we arrived at the pharmacological aspect of this publication. The ritual use of hallucinogens, the monotonous drumming, the repeated refrains, the extreme fatigue, the strict fasting, the frenzied dancing and so forth, during tribal ceremonies results in the

breakdown of ordinary cognition. Based on set and setting, the outcome is not necessarily disturbed, chaotic behavior, or insanity (i.e., disintegrative ASCs) what most of us would suppose. When the coping capacity of the “perceptual-cognitive-symbolic” processing is exhausted in a stressful, unmanageable situation, when the “coping machine” cannot handle the situation (this might be the hidden agenda of the Zen *koans*), or its influence is turned off in transcendental meditation or eliminated by the use of a powerful hallucinogen, a shift occurs. Then the “spiritual universe” opens up through the “direct-intuitive-nonlocal” channel, its particular content and form being affected, and steered toward an integrative form of ASCs by the proper set and setting.

Strassman (2000) has hypothesized that levels of dimethyltryptamine (DMT), the endogenous hallucinogenic compound of the brain, is released in near-death experiences, religious ecstasy, or by means of ritual techniques (spirit quest, shamanic initiation). Hallucinogenic drugs in general, and DMT in particular, are among the most powerful keys to spiritual (i.e. nonlocal) realms, to Hell or Heaven. In proper doses these psychotropic agents dissolve ego boundaries. In conditions of total ego-loss reason recedes as the mind’s fundamental orienting function and the new compass can be faith. This is not the inflated faith of dogmatic religions, which substitutes for empirical experience. Rather, it is faith in service of the Self in absence of the Ego. Reason is in service of the body-centered, “skin-encapsulated” individual Ego, and this companionship can barely guide someone under the influence of a powerful hallucinogen or in a deep ASC. As spiritual practices indicate, faith and spirit guides can do a better job in nonlocal realms, in the “Mystical Beyond”.

There is neither psychointegrative effect, nor meaningful “opening” with the recreational use of hallucinogenic compounds. Without the solid grounding of tribal traditions, which have been crystallized over centuries, even millennia, a “culture-alien” use of mind altering techniques results in meaningless experience, and at times in mental disintegration.

### Concluding Remarks

The authors are fully aware that they tried to accomplish something pretty unconceivable: explaining something not accepted by the mainstream with something unaccepted (yet?) by the

mainstream. Certainly, this is not the best way to get the approval of the mainstream. Many readers may think – not without good reason – that this article was too much of a stretch in a professional journal. Certainly, New Age literature is full of similar claims and statements presented in this essay. However, these authors – who have anthropological and neuroscience background – have come

from a different angle with the purpose to open their colleagues mind for rational interpretation of startling frontiers at the edge of science.

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#### REFERENCES

- Aspect, Alain, Jean Dalibar and Gerard Roger (1982). Experimental test of Bell's inequalities using time-varying analyzers. *Physical Review Letters*, 49:1804-1806.
- Bell, John Stewart (1964). On the Einstein Podolsky Rosen Paradox. *Physics*, 1:195-200.
- Crick, Francis (1995). *Astonishing Hypothesis: The Scientific Search for the Soul*. Scribner Publishing.
- Crow, Timothy (1997). Is schizophrenia the price that Homo sapiens pays for language? *Schizophrenia Research*, 28:127-141.
- Einstein, Albert, Boris Podolsky and Nathan Rosen (1935). Can quantum-mechanical description of physical reality be considered complete? *Physical Review*, 47:777-780.
- Emmons, Robert A. and Paloutzian, Raymond F. (2003). The psychology of religion. *Annual Review of Psychology*, 54:377-402.
- Engel, George (1977). The need for a new medical model: a challenge for biomedicine. *Science*, 196:129-136.
- Hameroff, Stuart (1987). *Ultimate Computing*. North-Holland.
- Horgan, John (2000). *The Undiscovered Mind: How the Human Brain Defies Replication, Medication, and Explanation*. Free Press.
- Jaynes, Julian (2000). *The Origin of Consciousness in the Breakdown of the Bicameral Mind*. Mariner Books.
- Lewis-Williams, David and Pearce, David (2005). *Inside the Neolithic Mind: Consciousness, Cosmos and the Realm of the Gods*. Thames and Hudson.
- Penrose, Roger (1996). *Shadows of the Mind: A Search for the Missing Science of Consciousness*. Oxford University Press.
- Pinker, Steven (2003). *The Blank Slate: The Modern Denial of Human Nature*. Penguin.
- Sarfatti, Jack (2005). *Super Cosmos*. AuthorHouse Publishing.
- Stern, August (1988). *Matrix Logic*. Elsevier Science.
- Strassman, Rick (2000). *DMT: The Spirit Molecule. A Doctor's Revolutionary Research into the Biology of Near-Death and Mystical Experiences*. Park Street Press.
- Tyler, Stephen (1987). *Cognitive Anthropology*. Waveland Press.
- Walsh, Roger (1991). *Spirit of Shamanism*. Tarcher/Putnam Book.
- Wheeler, John Archibald (1984). *Law without law*. In: *Quantum Theory and Measurement*. John A. Wheeler and Wojciech H. Zurek (Editors). Princeton University Press.
- Wilber, Ken (2001). *Grace and Grit: Spirituality and Healing in the Life and Death of Treya Killam Wilber*. Shambhala.
- Winkelman, Michael (2004). *Spirits as human nature and the fundamental structures of consciousness*. In: James Houran (Editor), *From Shaman to Scientist: Essays on Humanity's Search for Spirits*. Scarecrow Press.