

From Warehouse to Temple: Science Axioms and the Frameworks They Build

A round table discussion on the physics/consciousness interface from the experimental perspective

This is the first in a series of JNL colloquia looking at the place of consciousness in the current scientific canon. Our central question is simple: is there enough theoretical and experimental support to challenge the assumption that consciousness is an emergent property of the brain, as current physicalist dogma contends? And if that assumption is removed, what consequences and opportunities lie ahead of us? In keeping with the primary mission of the Mind-Matter Mapping Project, our panel discussions will try to focus on experimental approaches and applications-related aspects, rather than philosophical considerations.

Participants

Jean Burns has been Associate Editor for the *Journal of Consciousness Studies* since 1994. She is a theoretical physicist whose work ranges from entropy and information in quantum systems to free will and the ordering of quantum fluctuations as a possible mechanism in mental action and psychokinetic effects.

Richard Amoroso is Director of the Noetic Advanced Studies Institute and author of more than 200 articles and 20 books on quantum physics, cosmology and consciousness. He is a theoretical physicist specializing in Cartesian forms of the mind-body problem and is noted for the 1st physical model of qualia which could lead to breaking the 1st person 3rd person barrier. Amoroso has acted as Chairman of the Vigier Int. Physics Symposium and CASYS Conferences on multiple occasions and was Keynote Speaker at the 2010 Meeting of the Society for Scientific Exploration on Cutting Edge Energy & Advanced Propulsion Research where he introduced a new FTL model called the ‘Holographic Wormhole Drive’.

Matti Pitkanen is a theoretical physicist and former professor at the University of Helsinki. His primary research interest is Topological Geometro-dynamics, a subject on which he has published many books and articles, invited conference presentations and chapters in collective monographs on quantum mechanics, astrophysics and consciousness research.

Brenda Dunne was Laboratory Manager of the Princeton Engineering Anomalies Research (PEAR) laboratory from its inception in 1979 until its closing in 2007. She currently serves as President and Treasurer of ICRL, as well as Education Officer of the Society for Scientific Exploration. She is co-author with Robert Jahn of numerous journal articles and the books *Margins of Reality*, *Consciousness and the Source of Reality*, and *Quirks of the Quantum Mind*.

Ulrich Mohrhoff is a physicist affiliated with the Sri Aurobindo International Centre of Education. His primary research interests lie in the foundations of quantum mechanics and the interface of contemporary

physics and Indian philosophy/psychology – topics on which he has published numerous papers in peer reviewed physics journals. He was the founder and managing editor of *AntiMatters* (ISSN 0973-8606), a quarterly open-access e-journal addressing issues in science and the humanities from non-materialistic perspectives, which appeared from August 2007 till November 2009. His textbook *The World According to Quantum Mechanics: Why the Laws of Physics Make Perfect Sense After All*, was issued in 2011 by World Scientific Publishing.

Brian Millar followed a Ph.D. in chemistry with post-graduate research in experimental parapsychology at Edinburgh University (with Beloff) as well as University of Utrecht. This work resulted in over 50 papers published in major parapsychology journals such as EJP, RIP, JASPR and JSPR. Millar's sustained quest for a physical theory of Psi led him to introduce Observational Theories into the parapsychology modeling tool kit as early as 1978. This controversial hypothesis, arguing that the main source of Psi in successful experiments is attributable to the experimenter, rather than the subjects, remains the primary focus of Millar's research – as exemplified by the novel approaches put forth in the current issue of the JNL.

Moderator: Lian Sidorov

Neuroscience has made tremendous progress over the past few decades, yet the hard problem of consciousness (the question of how neural activity leads to subjective experiences) has not been persuasively resolved. Are we limited by the resolution of our current technology, or by the set of data we choose to look at? What additional evidence/ experimental directions do you feel should be admitted into this investigation?

J. Burns The "hard problem" is the question of how and why do we have conscious experience? If the brain is assumed to do everything, the question arises of why would consciousness be present? The simplest answer is that consciousness has a function, and the brain doesn't do everything. For instance, if we assume that consciousness includes the ability to make choices (free will), then its presence could save neural programming in the brain. The brain is a very complex organ, and it's unlikely that the presence of free will could be established by experimental observations any time soon. What is needed is more conceptual openness to the possibility of free will, so as to consider basic issues involved. For instance, assuming we have free will immediately brings us to the issue of energy conservation. But that's another question.

M. Pitkanen I see the fundamental problems as philosophical problems. Wrong ontology leads to pseudo- problems. Chalmers sees the hard problem as a problem of dualistic view: it is possible to have dualism of matter and mind consistent with the laws of physics but without reducing mind to matter and losing the assumption about real causative power of mind. Materialists see the hard problem as understanding how mind is a mere epiphenomenon: even at the level of principle this approach reduces to a mere empirical identification of mind-matter correspondences.

At the level of neuroscience the fundamental challenge is the understanding of consciousness as a genuinely new ontological level, whose dynamics does not reduce to that of matter although it

correlates with it because of the "aboutness" property of consciousness. I see this problem as a special case of a much more general problem at the level of physics: one should be able to describe the observer as a part of the quantum physical system. This requires quantum theory of consciousness. Quantum physics as we know it from textbooks is certainly not enough, but is a natural starting point.

I do not see current technology as the real problem, there are huge amounts of unexplained data. The real problem is the belief system of science. It is of course possible to imagine new experimental directions. For instance, the experimental work of Peter Gariaev (and others) concerning the effects of electromagnetic radiation on living matter should be expanded. Maxwell published his theory of electromagnetism 1865 and still many biologists think that biology could reduce to mere chemistry. Bio-electromagnetism also poses totally new challenges for physics itself: is the extremely simple linear theory of Maxwell really all that is needed?

B. Dunne Are we asking the right questions? Have we considered our inherent assumptions that might be limiting our ability to do this? The philosophical implications of consciousness, its origins, and its purpose have been debated since humans first became aware that it existed, and the answers that have been proposed have varied with the prevailing cultures, languages, and technologies. In my opinion, the most relevant issue that speaks to the relationship of consciousness and brain is the now well-demonstrated phenomenon of non-locality. Countless laboratory experiments and field observations have shown that consciousness is capable of accessing and generating information from and to remote times and locations, in ways that cannot be explained by any existing model of physics or brain function. The profundity of this fact cannot be overstated. The unresolved question of what happens when we die is the source of our deepest hopes and fears, and lies at the foundation of most religious traditions. Evidence that consciousness can function independently of the physical brain completely changes the name of the game and the nature of the questions that need to be addressed.

R. Amoroso The hard problem is solved by formulating a proper theory of Cartesian interactive dualism. Until now this has been beyond current physics; but the Noetic Theory cast in HAM cosmology changes this and is empirically testable.

B. Millar It has been said that the modern period of behavioral science began when psychology lost its *soul*, later it lost its *mind* and recently it almost lost *consciousness*. Only in the nick of time came the invention of new types of scanners which register brain function in real time while the subject reports his introspection. Early work seemed to suggest correlations between consciousness (in the sense of self-awareness) and particular cortical areas. Later research proved the adage that "There is no problem so complicated that, looked at in the right way, it can't be seen to be *even more complicated*". One of the few things on which workers in this field tend to agree is that consciousness is associated with connection between brain areas which would otherwise operate independently (the integration consensus). A number of animals recognize their own reflection in a mirror, even some birds. Biologically, consciousness is *cheap*, even though we don't (yet) know how to (re)produce it.

Undeveloped and messy as it is, consciousness research is undoubtedly a fascinating area. But does it have anything to do with parapsychology? Are there particular states of mind associated with Psi performance? Successful ganzfeld subjects report just idling passively; perhaps this is part of what Rhine meant by Psi is an UNconscious process. In guessing experiments subjects are typically unsuccessful in making confidence calls: the ESP process is apparently singularly opaque. Compare blind patients in which the primary visual cortex is destroyed and who consequently have no visual experience whatever: if asked to guess how many fingers are exposed many can still guess as much as 80% right (blind sight). Perhaps parapsychologists should look instead at UNconsciousness rather than consciousness.

There are indeed experiments which suggest some people can sometimes peek a little under the veil of unconsciousness. Almost all experiments to date have made the (contentious) assumption that those with the label "Subject" are actually those who input the Psi: if, on the contrary, the real subject is the Experimenter, then we have simply been looking in the wrong place.

Presumably what is meant by parapsychological proponents of consciousness is that Psi occurs in systems *capable* of consciousness. As an argument this is flimsy: we do not look for a theory of the Mary Celeste and the Loch Ness monster in the common element of Water. It is, though, tempting to speculate whether the two mysteries of consciousness and Psi might not have at least some commonality. At the present time, however, consciousness research has little solid to offer parapsychology. It is possible only to explain the unknown in terms of the known: to try to explain Psi in terms of consciousness research, an area which is only in marginally better shape than parapsychology, seems faintly perverse. On the other hand the notion that parapsychology (which has not even been able to solve its endemic replicability problem) might cast a flood of light on consciousness seems to me even more implausible. Asking poorly specified BIG questions like "God, the Universe and Everything" has a poor track record: parapsychologists should beware of demanding in a single step the answer to "Psi, Consciousness and Everything".

U. Mohrhoff The most probable reason why the question of how neural activity leads to subjective experiences has not been resolved is that it isn't the case that neural activity leads to (i.e., is causally sufficient for) subjective experiences. All we know is that some neural activity is correlated with certain subjective experiences. Improving technology or looking at a larger set of *objective* data might help with the physicalistic/mechanistic models I mentioned in the last paragraph of my article (Mohrhoff, 2012b), but it doesn't make them more useful philosophically (e.g., when it comes to understanding the correlations between neural activity and subjective experience). The way I see it, issues such as this can only be resolved subjectively, to the satisfaction of the individual, through his or her single-minded and persistent probing of subliminal domains of reality.

We share the assumption, at least in the Western post-Enlightenment tradition, that Mind is something created by the brain and its emergent features. If this is a view that you subscribe to, what is the most persuasive evidence for it? What evidence is there against it? And what would be a definitive test to settle the issue?

J. Burns The distinction between Mind as emergent from the brain (emergent physicalism) and Mind as able to be independent of, but with its contents correlated to, the brain (dualism) is the distinction between causation and correlation. There is no known experimental test that can make this distinction.

M. Pitkanen I do not share that assumption! Of course, biology and neuroscience give a lot of data consistent with the vision that matter implies mind. The fact is however that only correlations are in question. These correlations are expected only if one assumes that consciousness is *about* something - in particular the state of matter and its changes! In quantum theory quantum classical correspondence would correspond to these correlations - at least if generalized so that also quantum jump sequences that I identify as counterpart for evolving consciousness have space-time counterpart: the non-trivial implication is that classical space-time dynamics cannot be fully deterministic.

I am critical concerning the assumption that brain builds both sensory and cognitive mental images and one can localize consciousness to brain. To my view only the contents of sensory consciousness - not consciousness - can be localized in the sense that one can tell the region where the sensory mental image is registered. I am not at all sure whether it is only the brain where it is localized. Maybe the brain just builds symbolic representations for sensory mental images - gives them names. For instance, one can consider the possibility that sensory organs are carriers of primary sensory qualia and sensory percept is created as standardized mental images using sensory feedback from brain (oto-acoustic sounds in the case of hearing). Phantom limb and related phenomena provide an objection against this view, which can be circumvented if one is ready to accept new view about time solving the fundamental paradox of quantum measurement theory and providing a new view about memory.

To my opinion a wider perspective would be needed. The fundamental problems of biology and neuroscience reflect the fundamental problems of quantum measurement theory. How to achieve consistency of state function collapse with Schroedinger equation, how to understand the widely different characteristics of the geometric time of the physicist and subjective time of conscious experience (reversibility versus irreversibility, etc...). What information really is, is a secondary problem. Does only conscious information genuinely exist? Second law and Shannon entropy as measure of dis-information does not help much: the best situation that one can achieve is vanishing entropy and thus information! Standard approach assigns entropy to a state of system. Entanglement which in quantum computation is in fundamental role suggests that conscious information is always about relationships between at least two systems.

It is very difficult to experimentally test which ontology is correct since the very testing is based on ontology! New ontology can be defended only by its explanatory power and ability to solve paradoxes of the older ontology. No one has proved experimentally that quarks exists but every particle physicist believes in them nowadays.

R. Amoroso This has been the greatest error in philosophy of mind. Mind is not tantamount to brain; the brain is only one of three required aspects to formulate a theory of awareness. Experiments to isolate the life principle are proposed here to settle this issue.

B. Millar Walker suggested that waking up is a *threshold* effect: nothing interesting happens until sufficient neurons are QM-coupled: when that threshold is reached, however, the brain wakes up. I suggested he put a big computer into a fission reactor: the thermal neutrons QM couple otherwise unrelated circuits and the computer should wake up to self-awareness. He agreed; however there is one problem: after a time the chips simply "fry": does the self-aware computer have insufficient time to learn to be a "child"? Currently communications satellites are common around the earth and these incorporate big computers subjected to cosmic (particularly solar) radiation. Probably one would have heard if any communications satellite had begun to show signs of self-awareness. However they are built with circuitry "hardened" against radiation so it is hardly a fair test.

The notion that there is a quantum computer (QC) in our heads has attracted attention and has some plausibility on evolutionary grounds. A big brain must be paid for: more than 20% of total body energy goes to feed it: furthermore to accommodate the large head children are born in a non-functional state which requires many years of external maturation. Although theoretical proposals have been made no functional quantum effects have (yet) been found in the (wet-ware) brain. Furthermore QCs are especially good at things like factoring large integers, which cannot be said of humans. The QC hypothesis doesn't have much support, even though it would undoubtedly be theoretically economical if Psi could be treated as a side-effect of imperfect "quantum insulation".

B. Dunne Historically, models of the mind have been influenced by the prevailing technology. Thus, we have had electromagnetic, telegraphic, and radio metaphors to explain consciousness. Today, the technology of choice is the computer, so it should come as no surprise that we lean toward representing the mind as a computer. This works nicely as long as the question is limited to the nature of the hardware. But when we start to address the software - and even more troublesome, the programmer - the computer model falls apart. It's time we began to question the assumptions implicit in our pet metaphors and to consider whether we are asking the right questions.

U. Mohrhoff The way I see it, it's the other way around. (I quoted Sri Aurobindo: "the brain is not the creator of thought, but itself the creation, the instrument and here a necessary convenience of the cosmic Mind"(Mohrhoff, 2012b)). Evidence? There are no uninterpreted data, and the adequacy of a given interpretation is not an issue that can be resolved in the lab. An interpretation of the data must of course be consistent with the data, but again, the adequacy of a given criterion for the consistency of an interpretation with the data is not an issue that can be resolved empirically (at least not in the traditional sense of "empirical"). Once again, issues such as this can only be resolved subjectively, to the satisfaction of the individual, through a single-minded and persistent probing of subliminal domains of reality (as was done, for instance, by Sri Aurobindo, though most of us would have to take his word for it).

The physicalist view portrays the brain as the source of a unitary, conscious experience of self-hood. How do you understand the relationship between wave function collapse, conscious experience and self-identity?

J. Burns Not all physicists agree that there is such a thing as wave function collapse -- some consider what appears to be collapse as actually showing the result of decoherence (linking of a system with many small independent systems in the environment). Among those who think there is such a thing as collapse, only a minority think it needs a conscious observer or implies any relationship between consciousness and collapse. Among those who think there is such a relationship, the particulars would depend on the individual theory.

M. Pitkanen To my understanding the physicalist view already implies that mind reduces to matter. I do not share this view. For instance, contents of consciousness gives only extremely rough representation of reality - not 1to1 correspondence. Consciousness represents a separate ontological level but correlates with it because it gives representations of matter.

Wave function collapse involves an element that looks like a choice. One often forgets that there is also a conscious selection made in choosing the quantization axes (say choice of say direction of magnetic field to defined quantization axis of spin).

To my view these two selections could be seen as state function reductions but at widely different levels: measured microscopic system and the macroscopic system representing observer. An old proposal is that Zeno effect might be related to a continued span of attention. Indeed, standard quantum measurement theory states when state function has been reduced, subsequent identical measurements leave the state as such. This might carry some seed of truth in it but cannot be the whole truth: continued span of attention requires feed of metabolic energy so that something more complex is in question.

I do not believe that standard view about state function reduction is enough. I see quantum jump as a cascade-like process of state function reductions proceeding from long time and length scales to shorter ones and eventually stopping: this picture involves also new ontology of quantum physics which I have christened zero energy ontology.

I seen cognition and intentionality as something very essential and p-adic physics is a good candidate for their physical correlate. Number theoretic entanglement entropy based on p-adic norm I see as a key factor. It can have also negative sign and becomes information: the interpretation is as the conscious information assignable to the entanglement: the pairs appearing in the superposition represent instances of a rule.

The dynamics of consciousness would in this framework be based on negentropy maximization (NMP) which makes negentropic entanglement relatively stable. For instance, attention span would be analogous to Zeno effect: state function reduction would produce stable negentropic entanglement and it would survive the subsequent state functions reductions. Metabolic energy feed would to generate and preserve negentropic entanglement necessary for attention.

I am not quite sure what is meant with self-identity here. I want to distinguish between self-awareness as "I exist", which would characterize all kinds of awareness - even when no memory traces are left. Self-identity as self representation involves long term memory and a model for self and emerges as a high level construct. Here brain as builder of symbolic representations would be in an essential role.

Self hierarchy with subselves representing mental images of selves would be essential for understanding the experienced "now" of consciousness. How experienced time corresponds to the geometric time of the physicist in this framework is a very challenging question and the proposed answer leads to a rather radical picture differing from standard views in many respects: for instance second law must be generalized to allow the geometric arrow of time to have both directions; in living matter the opposite arrow would be tendencies which Fantappie called syntropic.

R. Amoroso The brain is only a transducer, a computer of sensory data and modulator of metabolism. As Penrose wrote, quantum theory is silent about the nature of wave function collapse. Self-identity is an eternal aspect of the soul, not the brain. There is no need to require wave function collapse in mental phenomena; instead the wave function undergoes continuous evolution.

B. Dunne There is a tendency to think of 'wave-function collapse' as some kind of physical process. In point of fact, it is nothing more than a transition from a state of probabilistic uncertainty to one of observed experience.

U. Mohrhoff Actually there are physicalist philosophers who deny that there is such a thing as a unitary, conscious experience of selfhood. As to the question, there is no such thing as a wave function collapse, and so there is no relationship between wave function collapse and whatever. As Asher Peres, one of the most sensible interpreters of quantum mechanics, wrote, "there is no interpolating wave function giving the 'state of the system' between measurements." What indeed would be the use of such a wave function, considering that statements about the 'state of a system' can only be tested by means of measurements? As I explained in my (2012a) paper, the view that a wave function collapses upon measurement is due to a misinterpretation of the time on which a wave function depends. This time is the

specific time of the measurement to the possible outcomes of which the wave function serves to assign probabilities. Because the time dependence of the wave function is not the continuous time-dependence of an evolving physical state, the wave function is not an evolving physical state. A fortiori, it cannot collapse. The issue of self-identity is of course a fascinating question by itself, but that is probably not what this question is about.

How do we begin to think about a physics model for remote perception? What do you make of the extremely brief target contact windows and the sensory fragmentation typical of remote viewing sessions? And how would something that is initially perceived only very vaguely (i.e. manmade, tall, sharp) gradually crystallize into a concept with complex physical and abstract characteristics (i.e. statue of a crowned woman, torch, new world, destitute crowds, hope, freedom)? What role could the repeated target ID prompt play in RV? How could it strengthen target contact or illuminate increasingly wider cognitive basins associated with it? Why do you think the amount of data produced about a target increases with its Shannon entropy gradient? (see May & al. 2000)

J. Burns Contact windows, sensory fragmentation, sensory integration all sound like they have to do with the way the brain brings information into consciousness. When perceptual information is received by the brain, it is first processed in assorted specialized centers (i.e., for color, motion, etc.). Then it's linked to memories and anything else that might identify it. Once it's identified, it's then associated with things in the environment and/or context. It seems like psi data is processed similarly to perceptual data, except that material received via psi reaches the conscious mind from a slightly lower level of integration.

Q4b What role could the repeated target ID prompt play in RV – how could it strengthen target contact or illuminate increasingly wider cognitive basins associated with it? As noted above, once psi data reaches the brain, it appears to be processed similarly to perceptual data. Probably repeating the target ID, putting a written version where the viewer can see it, etc., helps to focus the attention of the viewer.

Q4c Why do you think the amount of data produced about a target increases with its Shannon entropy gradient? There are different types of entropy, and the type measured in the experiment referenced above simply measures how complex a picture is. The psi scores were better for pictures that were more complex. This is hardly surprising - a more complex picture tends to be more visually interesting and holds the attention better. There is no necessary connection between entropy of a complex picture and thermodynamic entropy of a physical system. May has proposed that perhaps the connection between entropy of a complex picture and psi can be generalized to a connection between thermodynamic entropy and psi, but that is speculation.

B. Millar How is pictorial material to be treated in the Observational Theory (OT)? The standard model of ESP is that it is (as the name suggests) basically a form of perception. This case is (conceptually) easy to check: present material tachistoscopically to the subject, so that he is not consciously aware of the content and see whether there are similar effects as reported in the Psi experiment. If, however, experiment with subliminal stimulation shows no similarity then this suggests

that ESP is NOT a form of perception at all. OT is more complex since it is basically a PK model. Through what observation(s) does Psi enter the system? Usually in such work after collating the transcript the next stage is to reveal the target pool. The "subject" then ranks the pictures in order of subjective likelihood. Only when this is done does the Experimenter (E) "open the box" and show the actual target. Both E and S (Subject) get feedback (E often slightly ahead of S). (This suggests that in these experiments the Psi contributions of E and S may be comparable.) Both E and S use S as a complex Random Generator. The internal structure of this RG depends on S's total life experience and particularly on the internal library of "elements" he has built up from other sessions: the whole is highly complex and for a large part idiosyncratic: one may begin to map its structure by looking at "misses". From the MOT (Minimal Observational Theory), however, it is known that Psi spreads its effect over the internal probabilities of the elements in an optimal way.

Is an effect of Shannon Entropy Gradient (SEG) to be expected within the OTs? The experimenters' rationale is that the normal senses are relatively insensitive to absolute level but they react strongly to change. They use SEG as a measure of rate of change; but make no attempt to see if this is actually useful for pictorial material presented tachystoscopically. Somewhat similar is edge detection, which is carried out continuously in the wet-ware of the retina. It would be interesting to do the analysis again using edge-detection as well as SEG.

M. Pitkanen The description of McMoneagle about the remote viewing process brought to my mind what a scientist is doing when developing an idea. First there is just some hunch and one just lets ideas flow freely without any censoring attempts. Even the craziest associations are documented and gradually a sharper vision builds up. Usually this process could be called creative: I would call it a process in which one stays tuned and receives information from some source.

To even try to answer the questions one should have some general vision about remote mental interactions. In TGD framework I see them as special cases of what occurs in everyday life. To my view one particular case of remote mental interaction is concretely realized as I decide to write this sentence and do it or when I perceive my own body or nearby environment.

The new view is based on the motion of magnetic body which uses biological body as motor instrument and sensory receptor. Both information transfer and control are remote mental interactions between magnetic body and biological body in this framework. One could end up with this vision in the following manner:

1. EEG is known to correlate very strongly with contents of consciousness: even mind reading is becoming possible using EEG. This is in sharp contrast with the belief - analogous to the belief that non-gene coding DNA is just junk - that EEG is a kind of side product of nerve pulse activity.
2. From the well-known quantal effects of ELF em _fields on vertebrate brain I end up with a vision involving the notion of magnetic body as receiver of sensory data from biological body and controller of it. The dimensions of the magnetic body are astrophysical and EEG serves as control and communication tool.
3. Here testing is possible: can one really explain resonant EEG frequencies in terms of brain circuits or does the quantum view based on cyclotron frequencies and Josephson frequencies associated with cell membranes provide a better explanation?

In this framework the formation of magnetic flux tubes between target and remote perceiver would

be the space-time correlate for the remote perception. On the basis of this picture one should understand what happens. At the moment of direct sensory contact the perceiver and target would fuse to a single negentropically entangled system. After the splitting of the contact there would exist only memory images. The direct sensory contact need not be directly conscious to us and at our level of hierarchy of consciousness it would manifest only as impressions produced by cognitive processing.

One can ask whether the process leading from unconscious-to-me to direct sensory input to a detailed remote perception is similar to that for ordinary perception. The sensory input is first analyzed in small pieces corresponding to various features of sensory input and then recombined into a coherent picture consisting of standardized mental images and giving rise to what might be seen as an artwork rather than a faithful copy.

Concerning the question about the role of entropy gradients: attention is directed to something which is interesting. If the target is dynamical strong entropy gradients can be expected. It is expected to be also interesting and one would expect that remote viewer directs attention to it. Just a thought: if the total entropy of the viewer and target is constant (the optimal situation) the increase of target entropy decreases the entropy of viewer: could this be interpreted as increase of conscious information of viewer about the target?

B. Dunne There are many factors involved in the remote perception experience, most of which are subjective in nature and not only will vary from one participant to another, but will vary from one experience to another for the same person. For example, how do our cognitive associations, prior familiarity with a target, or its similarity with a prior experience, influence our interpretation of the remote perception experience? How does the relationship between the agent and percipient, or between the experimenter and participants, affect the quality of the acquired information? What are we trying to demonstrate or prove by doing this experiment? Are we having fun yet? None of these are easily quantified.

U. Mohrhoff To my mind, remote perception is a kind of perception that is independent of neural activity in a significant way and therefore is entirely beyond the reach of "physics models." I do not consider myself qualified to answer the remaining questions, except that the increase of data with the gradient of Shannon entropy appears to follow from the very meaning of "data." For a simple(-minded) illustration, consider the picture on your TV. Because you can change its hue and its brightness, these global parameters are not part of the data. It's the ways in which hue and brightness change across the image (and across time) that constitute the data. There may be a deeper truth behind this. Manifestation proceeds by differentiation; unmanifest reality is reality without broken symmetries. Unless "here" is in some way different from "there," there is neither "here" nor "there"; reality is undifferentiated with respect to space. In other words, if reality is invariant under space translations, there is no space. Likewise, unless "now" is in some way different from "then," there is neither "now" nor "then"; reality is undifferentiated with respect to time. In other words, if reality is invariant under time translations, there is no time.

What, in your opinion, are the most promising experimental and theoretical directions to be followed toward a falsifiable model of anomalous perception (RV) and anomalous perturbation (PK)?

J. Burns We know so little about psi that it's very hard to say which directions will turn out to be more promising. In particular, it's very difficult to know what type of physics model will be applicable, so it's a case here of let every flower bloom.

On the other hand, in the last few years there has been important work in parapsychology that has found new effects of psi, not previously known. Additionally, important work in parapsychology has found parallels between the functioning of psi and findings from mainstream science (neuroscience and consciousness studies) about our perceptual and psychological functioning. This work can give us useful insights about new directions to explore. Here are some references:

New effects: Presentiment: See Dean Radin's book "Entangled Minds."

Retrocausal versions of psychological effects: See (2011) article by Daryl Bem, "Feeling the future" (available on internet as pdf).

Experiment showing that observation by meditators can collapse the wave function: See (2012) article by Dean Radin, "Consciousness and the double slit interference pattern" (available on internet as pdf)

Parallels with findings in consciousness studies: Ed Kelly et al., (2009) book "Irreducible Mind."

Parallels with findings in psychology re the interface between conscious and unconscious: James Carpenter, (2012) book "First Sight."

M. Pitkanen I tend to reduce the basic problem to that of fundamental physics. At the theory front the development of theoretical models solving the basic paradoxes able to explain and possibly even predict is the basic goal.

In the framework of my own pet theory, RV and PK would be special cases of what we are doing all the time: magnetic body remotely perceiving biological body and its environment and remotely controlling magnetic body. Developing of tools making magnetic body "visible" would be the basic challenge for experimentalists in TGD Universe.

B. Dunne How can one falsify a anomaly? By definition, an anomaly is an experience that falsifies the norm. Science should be a two-way process where data drive new theories, and theories stimulate the generation of new data. Unfortunately, most contemporary science is primarily theory driven, and as Einstein pointed out, our theories determine what we can observe.

U. Mohrhoff We do not even have falsifiable models of the "regular" goings-on in the physical world. All we have is correlations, classical-physical ones (which, being deterministic, allow us to think of the correlata as causes and effects), quantum-physical ones (between measurement outcomes), and metaphysical ones (like those between neural activity and subjective experiences). We do not know how to explain these correlations, and an ever-growing number of quantum-theoretical "no-go theorems" makes certain that it will stay that way. Heck, we don't know how (by what kind of physical mechanism or natural process) matter acts on matter. How then can we hope to understand how our minds act on our bodies, let alone how they act on inanimate matter at a distance from our bodies?

B. Millar Those who talk about Psi without a theory *literally* don't know what they are talking about. And what kind of theoretical model looks promising? There are 3 principal desiderata:

- 1) Psi should be firmly anchored in the physical world. It is necessary to specify an experiment in terms of physical manipulations. An authentically Mind Over Matter theory is untenable as science: if Mind cannot be controlled by material manipulation then initial conditions are unspecified and probably the best one can say is "funny things can happen".
- 2) It should be possible to express the Law (or Laws) of Psi as a Principle of Limitation. In other words it must specify what Psi can NOT do. Otherwise as in (1) "anything goes".
- 3) There should be as few axioms possible and the theory should generate a large number of testable consequences. To facilitate the latter the Law should preferably be expressed in exact (mathematical) form.

There is only a single parapsychological theory of which I am aware that meets these criteria, Observational Theory (OT). In my "credo" piece in this issue I discuss at somewhat greater length a minimalist version (MOT) which seems to me useful: this is close in spirit to the treatment of Schmidt. As the name suggests the underlying idea is to make the minimum possible addition to current physics in order to produce a world with Psi-like features.

The MOT is unashamedly reductionist. It used to be said that an organism can do only two things, Twitch (muscle) and Squirt (chemical secretion). On the MOT the repertoire is increased to three- Twitch, Squirt and Psi. The Psi of the MOT is no less machine-like than the others: it consists merely in equalizing the probabilities at its two input terminals, even though the physics of how it does this is obscure. At first sight this seems somewhat dismal, a degradation of human dignity. A little reflection, however, reveals that this is by no means the case. Consider what humans (with a lot of help from evolution) have achieved from this bare menu: I feel personally that this exalts the dignity of the human being rather than diminishes it.

Further the MOT is by no means complete: large areas remain enshrouded in mystery. It is an open framework with place to add further elements as they become available.

A logical deduction from the OTs is that it is just as likely that the experimenter is the actual source of Psi rather than the nominal Subjects. In my main paper I suggest a number of methods to determine who is actually responsible. If it turns out to be the experimenter, using many subjects is a psychological ritual, the function of which is to work him into the right frame of mind at feedback. I suspect that this "illicit" use of Psi by the experimenter is the root of the problem of non-repeatability in parapsychology.

If it turns out that Mind is ultimately as elemental as Matter, what major implications do you foresee for science?

M. Pitkanen Maybe the most important consequences would be at the level of general world view. The recent value-free materialistic world view sees the external world, even other human beings, as a source of energy and materials and a kind of tool box. Realizing that every physical system - be it stone or bacterium - possesses a rudimentary awareness would transform our world from a warehouse to a temple.

What the implications for science would be depends on one's pet model. Personally I almost-believe in notions like magnetic body, identification of dark matter in terms of an effective hierarchy of Planck constants, zero energy ontology, and quantum jump as a moment of re-creation. In this

belief system the world according to science would transform to something, which we ourselves are co-creating. It is not something doomed to obey statistical determinism of quantum theory. It is not plagued by various determinisms like the recently prevailing market economy determinism and genetic determinism.

Also new techniques of healing can be imagined. Technologies producing energy and allowing a remote use of energy, producing various raw materials such as metals synthetically, technologies allowing new quantal communications and quantum computation like processes, can also be imagined. Even editing of our geometric past would be possible if we are actually 4-D entities rather than precisely 3-D ones (Libet's findings suggests this in the time scale of .1 seconds).

R. Amoroso Noetic Field Theory promises a whole array of conscious technologies such as remote viewers, telepathy machines, telecerebroscopes, medical tricorders as in Star Trek. The 'conscious quantum computer' will allow psychology to become a hard science instead of the art it is today, treatment for autoimmune diseases, grow food at an accelerated rate to end world hunger, and many others such as quantum computer music that can resonate qualia directly into the mind for enhanced experience.

J. Burns New phenomena, extensions to known physical laws, perhaps some new principles that pertain only to consciousness.

B. Dunne I have a problem with the very question of whether Mind is as elemental as Matter. It implies a duality; an either/or relationship that I find misleading. I much prefer a complementary relationship, like that of wave and particle where both are simply two different perspectives of the same thing.

U. Mohrhoff Neither mind nor matter are "elemental." Intrinsically, Ultimate Reality is beyond categorization, but when it presents itself to itself, it acquires subjective and objective aspects. These two kinds of aspects are co-dependent. When, in the course of evolution, they re-emerge, the objective ones are at first seen as independent realities, the subjective ones as dependent on them, leading to the false belief that objective aspects can exist without subjective ones (and on to the pseudo-problem of how subjective ones can emerge from objective ones). At some point in an individual's spiritual evolution a drastic reversal of his or her unassailable convictions is bound to occur: the realization that consciousness is originary and that the road to reality leads inward. What awaits us there is (among many other things) the discovery that the ultimate subject (UR as that *for* which the world exists) is identical with the ultimate object (UR as that *by* which the world exists).

We come to see that what is present to our physical senses is only the material shell of cosmic existence and what is obvious in our superficial mentality is only the margin of immense continents which lie behind unexplored. To explore them must be the work of another knowledge than that of physical science or of a superficial psychology. (Sri Aurobindo, 1999, p. 458)

At a minimum we can expect from a future science that its correlata (and the initial and boundary conditions affecting their correlations) will be rich in subjective and/or qualitative content, and that, consequently, the correlation laws will not be mathematical. We can also expect more powerful intuitive faculties of knowledge to emerge and play an increasingly larger part.

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