Lian Sidorov: *Both of you approach the problems of the standard model by revising its basic axioms - essentially starting with a new interpretation of its physical building blocks. Could you briefly summarize this approach?*

Matti Pitkanen: The identification of space-times as 4-dimensional surfaces of certain 8-dimensional space is the core element of TGD and solves the conceptual problems related to the definition of energy in general relativity. The new space-time concept, many-sheeted space-time as I call it, has dramatic implications, not only for physics, but also for biology and for consciousness. Basically because the hard reductionistic view about the universe is replaced by a quantitative view about how reductionism fails.

The mathematization of the basic vision is based on the idea that quantum physics reduces to an infinite-dimensional classical geometry for what might be called a world-of-worlds, the space of all possible 3-surfaces. This idea is in some sense very conservative: there is no quantization in this theory and the only quantal aspect is the quantum jump. The belief is that infinite-dimensional geometric existence, and therefore also physics, is highly unique. That this might be the case is suggested by enormous amount of futile work in trying to construct quantum field theories free of infinities as well as the experience with simpler infinite-dimensional geometries.

The most abstract formulation of TGD is as a generalized number theory obtained by generalizing the notion of number to allow infinite primes, integers, etc.. As a result geometric objects like space-time-surfaces can be regarded as representations of infinite primes, integers,.... Number theoretical formulation leads naturally to the notion of p-adic physics (p-adic number fields are completions of rational numbers, one for each prime p=2,3,5,7,...) and one ends up to the generalization of space-time surface by allowing both real and p-adic space-time regions, the latter representing geometrical correlates of cognition, intention, and imagination whereas real regions represent matter.

One implication is the so called p-adic length scale hypothesis predicting a hierarchy of length and time scales serving as characteristic scales of physical systems. The possibility to generalize information theory by using number theoretic notion of entropy leads to a very general number theoretical characterization of living systems for which an appropriate p-adic entropy is negative and thus tells that system has a positive information content. The new view about the relationship of subjective and geometric time is one important aspect of the approach and solves the basic paradox of quantum measurement theory and a long list of closely related paradoxes of modern physics. It is also crucial for TGD inspired theory of consciousness.

LS: *Are there historical figures from which you can claim inspiration or current physical theories under discussion which offer points of convergence with your model?*

MP: Wheeler was my remote guru and the reading of his writings was for me

a kind of turning-point experience. Wheeler brought topology into theoretical physics. Wheeler also introduced the notion of super-space, infinite-dimensional space of all possible 3-geometries having Riemann metric and serving as the arena of quantum gravitation. The replacement of superspace with the space of 3-D surfaces in 8-D imbedding space (world of worlds) turned out to be the only approach giving hopes of constructing quantum TGD: all the other approaches failed completely. Einstein has of course been second great figure. It was quite surprise to find that general coordinate invariance generalized to the level of configuration space of 3-surfaces (world of worlds) fixes the basic formulation of TGD almost uniquely just as it fixes the dynamics of general relativity. By the way, from some article of Einstein I learned that he was very conscious about the problems related to the relationship between subjective time and geometric time and believed that reality is actually four-dimensional but that our ability to "see" in time direction is poor.

TGD can be also seen as a generalization of the superstring approach and generalizes that basic symmetries of superstring model, the most important symmetry being so called conformal symmetry. In superstring approach conformal symmetry forces the basic objects to be 1-dimensional strings, in TGD it forces them to be 3-D surfaces. At algebraic level TGD is very much like superstring models but the dimension of space-time is the physical dimension D=4 rather than D=2.

LS: *How do you view the relation between material systems and consciousness? Is one an emergent property of the other or are they equivalent on some level?*

MP: I do not share the materialistic belief on equivalence of mind and matter. I believe that consciousness and even cognition are present even at elementary particle level. Not monism, not even dualism, but tri-partism. Spinor field in the "world of worlds"/quantum history/"solution of quantum field equations" defines what might be called particular objective reality. Subjective existence corresponds to sequence of quantum jumps between quantum histories. Material existence in geometrical sense corresponds to space-time surfaces, the realities of classical physics.

In this framework there is no need to postulate the separate existence of theory and reality: "solutions of quantum field equations" do not only represent realities, they are the objective realities. Subjective experience corresponds to quantum jumps between "solutions of quantum field equations", something always between two objective realities. Giving up the materialistic belief in a unique objective reality resolves the basic problems of quantum measurement theory, and provides a new view about relationship between subjective time (sequence of quantum jumps) and geometric time (coordinate for space-time surface). The price paid is a rather high abstraction level: it is not easy to translate the view about realities as spinor fields in the world of worlds to practical experimental tests! Here however the quantum-classical correspondence helps.

LS: *How would you summarize your approach to remote mental interactions like anomalous cognition (remote viewing) and anomalous perturbation (PK)?*

MP: There are several elements involved: topological field quantization, the notion of conscious hologram, sharing of mental images, and the basic mechanism of remote mental interactions based on MEs. a) The key ingredient is topological quantization of classical fields implied by the many-sheeted space-

time concept. Space-time surface is like an extremely complex Feynman diagram with lines thickened to 4-dimensional space-time sheets. These 4-dimensional lines represent the coherence regions of classical fields and matter (atoms, molecules, cells,..). In the vertices where the 4-dimesional lines meet, the classical fields interfere. Vertices are like points of a hologram whereas lines are like laser beams.

Especially important "lines" of the generalized Feynman diagram are "massless extremals" (MEs, "topological light rays"). They represent classical fields propagating with light velocity in a precise targeted manner, without weakening, and without loss of information, somewhat like radiation propagating in wave guide in a single direction only. MEs are key factors in TGD based theory of living matter. Magnetic flux tubes and their electric counterparts (biosystems! are full of electrets) are equally important "lines" of the generalized Feynman diagram.

b) Conscious hologram is a fractal-like structure, and the basic implication is that there is no preferred length scale where life and consciousness would emerge or exist only. The transfer of supra-currents from superconducting space-time sheets, typically magnetic flux tubes, to smaller space-time sheets, say atomic space-time sheets, induces breaking of superconductivity, dissipation, and Darwinian selection by self-organization. The cyclic flow of ions between two space-time sheets is also the basic mechanism of metabolism. An ordinary hologram gives rise to stereo vision and for the conscious hologram this corresponds to a fusion of mental images associated with various points of the hologram. When mental images resemble each other sufficiently, they can fuse and give rise to stereo consciousness (right and left visual fields fuse to give rise to stereovision if they resemble each other sufficiently).

c) Sharing of mental images is a new notion. The subselves of two unentangled selves can entangle, which means that a shared and more complex mental image results: this is the basic mechanism of remote sensing. The entanglement of subsystems of unentangled systems is not possible if one uses standard notion of subsystem. The new notion of subsystem is inspired by the length scale thinking of quantum field theories (everything is always defined in some length scale resolution) and the blackhole-like aspects of the space-time sheets. The entanglement of subsystems is not seen in the resolution characterizing the systems so that one can say that the systems are unentangled although subsystems are entangled.

d) A more detailed mechanism for remote mental interactions is as following: low frequency MEs (EEG range typically) connect remote viewer A to a collective multi-brained magnetospheric self M acting as a medium and M to the target T so that A-T entanglement and sharing of mental images becomes possible. All A-M communications (such as asking questions about a given target) could be based on sharing of mental images. Remote viewers could have more or less permanent communication lines to the magnetosphere.

This is enough for remote sensing. For remote motor interactions (say PK) also high frequency MEs are needed. They propagate like massless particles along low frequency MEs and induce at the second end leakage of supra currents between magnetic flux tubes and atomic spacetime sheets inducing self-organization, and also PK effect. The low-high dichotomy corresponds to sensory-motor dichotomy and to quantum-classical dichotomy for quantum communications. The favored frequencies of high and low frequency MEs are predicted to be in certain constant proportions and the findings of homeopathy support this prediction.

Cells and other structures have "remote mental interactions" inside the body via this mechanism. Also sensory representations at magnetic field body are realized by the same mechanism with microwave topological light rays (most probably) from brain propagating along EEG MEs and inducing self-organization at the personal magnetic body. Sensory representations are also possible at the magnetosphere and perhaps even at larger magnetic structures, which could have sizes of light lifetime. Thus human consciousness has definite astrophysical aspect.

LS: *How do you interpret the effect of geomagnetic fluctuations and local sidereal time on anomalous cognition?*

MP: The low level of magnetic noise seems to be the first pre-requisite for anomalous cognition performance. The interpretation is that magnetospheric mind must have low level of arousal. The performance seems to increase around a 2-hour interval surrounding 13.30 local sidereal time, which is the time in coordinate system fixed with respect to stars rather than sun. These findings, together with the general vision about magnetic flux tube structures as templates of life, suggest that not only Earth's magnetic field but also interstellar magnetic fields could be key players in the remote mental interactions.

a) That magnetic fluctuations can mask remote mental interactions gives an idea about the strength of the interstellar magnetic field. The delay for remote mental interactions is in the range t=13-17 seconds and should correspond to the time scale defined by proton's cyclotron frequency of the interstellar magnetic field: this implies that it should have strength in the interval 10-13 nT. On the other hand, at frequencies corresponding to $f = 1/t$ the intensity of the geomagnetic fluctuations is about 10 nT. It would seem that unmasked interstellar magnetic field of strength about 10-13 nT is crucial for remote mental interactions.

b) Interstellar magnetic fields quite generally have strength in 100 nT-.01 nT scale and various cyclotron time scales are time scales of human consciousness. The only interstellar magnetic field, whose flux tubes could emerge in the direction which is at meridian 13.30 ST, is the dipole like magnetic field created by galactic center having intensity of order 100 nT near the galactic center and intersecting galactic plane orthogonally. Supernovae carry magnetic fields in the range of 10-30 nT; solar wind carries magnetic field with average strength 6 nT; plasma sheet at Earth's night side, known to be strongly self-organizing structure carries magnetic field of strength about 10 nT. At least for an inhabitant of TGD Universe believing in fractality of consciousness, these findings suggest that galactic magnetic fields form kind of a galactic nervous system just as Earth's magnetic field forms the nervous system of Mother Gaia.

c) Why 13.30 ST is so special could be und! erstood if the flux tubes of interstellar magnetic field attached to the living matter wind during the rotation of Earth and this winding introduces noise making remote mental interactions less probable. During 2-hour interval around 13.30 ST the effects of winding are smallest.

LS: *Temporal effects such as pre-cognition and retro-pk have been a long-standing puzzle and complication for the emergence of compelling physical models in parapsychology. How do you solve these paradoxes within the framework of your theory?*

MP: In TGD framework one is forced to modify the basic beliefs about time. The subjectively experienced time corresponds to a sequence of quantum

jumps between quantum histories. Subjective time is however not experienced as discrete since selves (self is a system able to avoid bound state entanglement with the environment and has spacetime sheet as a geometric correlate) experience the sequence of quantum jumps as a kind of average. The reality resulting as an outcome of a given quantum jump is a superposition of space-time surfaces which look the same in the observer-dependent resolution defined by the p-adic length scale. One can say that every quantum jump leads to what sensorily looks like a s! ingle classical spacetime, kind of quantum average spacetime. Subjective time corresponds to the geometric time in the sense that the contents of consciousness are strongly localized around a certain moment of geometric time at the classical space-time surface. Spacetime is four-dimensional but our conscious experience about it gives information only about a narrow time slice (at least we believe so) defining what might be called psychological time. The increment of psychological time in single quantum jump is about 10^{-39} seconds by an estimate based on simplest possible assumptions. Psychological time corresponds also to the front of a phase transition transforming p-adic spacetime sheets (intentions, plans) to real space-time sheets (actions) and propagating towards the geometric future.

In each quantum jump the classical quantum average spacetime is replaced by a new one. Also the geometric past changes in quantum jump so that there is no absolute geometric past (subjective past is of course absolute). This explains causal ! anomalies like those observed by Libet, Radin and Bierman, and Peoch. Geometric memory is essentially seeing into geometric past. Intentions and plans and expectations mean seeing to the geometric future in the p-adic sense. Precognition is time reversed memory. Intention, precognition, and memories are not absolute since both geometric future and past change in each quantum jump. The editing of the geometric past, say changing memories by changing the state of the brain in geometric past, is possible.

LS: *Mark Germine's findings seem to suggest that the conscious measurement of an event by one brain tends to reduce the element of surprise for subsequent conscious observers, as measured by the associated event related potential. How do you interpret these findings?*

MP: The new view about classical fields forced by topological quantization leads to the notion of field/electromagnetic/magnetic body. Each material system, atom, cell,.. is accompanied by a field body which is typically much larger than the physical body and provides kind of symbolic representation for the system analogous to a manual of an electronic instrument. The magnetic body has the role of a computer monitor at which sensory representations are realized. The "features" produced by the information processing in brain are assigned to a given point, call it P, of the personal magnetic body by entangling the corresponding mental images with "simple feeling of existence" mental image at P. EEG MEs ("topological light rays") are correlates for this entanglement.

Besides personal magnetic bodies also sensory representations at magnetosphere of Earth are possible and give rise to magnetospheric consciousness. Magnetospheric selves receiving conscious information from many brains are possible and might be crucial aspect of all social structures. Mark Germine's findings can be understood if one assumes that the two persons receiving the unexpected stimulus at slightly different times are "neurons" of the same multibrained self. After having perceived the oddball stimulus once through the first brain, the multibrained self is less surprised, when it experiences the oddball stimulus through the second brain.

LS: *Both of your models require massive quantum coherence as a basis for conscious experience. How do you solve the famous decoherence problem?*

MP: In many-sheeted spacetime the hot, wet and noisy atomic spacetime sheets are not the only ones: there are larger and very cold spacetime sheets containing low densities of superconducting matter. In particular, magnetic flux tubes of Earth are superconducting. Thus one has macroscopic quantum coherence. This is not enough: one must have also macrotemporal quantum coherence. At first this seems impossible: single quantum jump corresponds to an increment of geometric time about 10^{-39} seconds. This time is identifiable as the decoherence time so that situation seems even worse than in standard physics! This picture cannot be correct and the explanation is simple: bound state entanglement is stable in the quantum jump, and when a bound state is formed no state function reduction and state preparation occurs in the bound degrees of freedom. Entire sequence of quantum jumps (elementary particles of consciousness) binds to form what is effectively like a single quantum jump, period of macrotemporal quantum coherence (atom, molecule,... of consciousness). Decoherence time can be identified as the lifetime of the bound state.

Unfortunately, even this is not enough since this is essentially what standard physics predicts. The final piece of the puzzle comes from quantum spin glass degeneracy. Spin glass degeneracy means that there is a gigantic number of spacetime surfaces which differ from each other only because they have slightly different classical gravitational fields. Bound states result, when two space-time sheets are connected by join along boundaries bond. Spin glass degeneracy means in this case that there is a huge number of different join along boundaries bonds and thus also an immense bound state degeneracy. When bound state is formed it decays with very high probability to a new bound state of this kind since for free state (no join along boundaries bonds!) the spin glass degeneracy is not present and the number of these states is much smaller. Thus the time spent in spin glass degenerate bound states, decoherence time, is much longer than in standard physics universe! . From the po! int of view of standard physics the new spin glass degrees of freedom are hidden and standard physicist identifies degenerate bound states as one and the same bound state. Therefore the measured lifetime of the bound state appears to be much longer than predicted by standard physics.

LS: *A natural sequel to the previous question: what is the physical basis for individual memory and for the sharing of mental images as seen in remote viewing, telepathy and other transpersonal experiences (Jung, Grof, Stevenson)?*

MP: The essential difference between the paradigm of 4-dimensional brain and standard neuroscience is that there is no need to store memories in the geometric now. The simplest mechanism of geometric memory is the quantum mirror mechanism. To remember some event which happened one year ago is to look at a mirror at a distance of 1/2 light years and see what occurs subjectively now in the geometric time at a temporal distance of 1 year.

The minimal option is based on sharing of mental images made possible by time-like entanglement. Time-like entanglement not allowed by standard physics. In TGD timelike entanglement is made possible by the partial nondeterminism of the variational principle telling which spacetime surfaces are possible. This nondeterminism plus the inherent nondeterminism of p-adic field equations are core elements of TGD inspired theory of consciousness. They also make possible quantum-classical correspondence and symbolic and cognit!

ive representations of objective and subjective realities (world-of-worlds level) at spacetime level (world level) responsible for the self-referential aspects of consciousness. I have already spoken about sharing of mental images as basic telepathic mechanism and time-like entanglement also makes possible the sharing of mental images between the geometric now and the geometric past. Classical signaling is not necessary but is of course not excluded. Microtubules seem to be optimal candidates as far as declarative long term memories are considered.

The sharing of mental images is a universal mechanism of remote sensory experiencing (long term memory, sensory representations, remote sensing, transpersonal experiences). Remote motor actions such as PK require the involvement of high frequency MEs propagating along entanglement generating low frequency MEs and inducing self-organization at the receiving end.

LS: *Is remote sensing of a remote physical target (as opposed to collective information) possible in your model - and on what basis?*

MP: In TGD world everything is conscious and consciousness can only be lost. There are also reasons to believe that practically all systems serve as "computer monitors" giving rise to sensory representations. Therefore also "nonliving" physical targets could define sensory representations at the magnetosphere.

There is a strange finding about meteor sounds supporting this vision. Meteor sounds have been both heard and instrumentally detected. The frequency spectrum was in the interval of thalamo-cortical resonance frequencies around 40 Hz whereas the expectation was that the spectrum would cover the whole range 20-20.000 Hz. The intensity of the sounds was also much stronger than expected if the electromagnetic radiation (inducing sounds at the surface of Earth) generated by the meteor had spherically symmetric distributions.

This suggests that ELF MEs corresponding to frequencies around 40 Hz connect not only brains but also "dead" objects to the magnetosphere and that the radiation was amplified selectively in these wave guides. Hence even "dead" objects could be sensorily represented at the magnetosphere. If the remote viewer can be seen as a client of a magnetospheric multi-brained self providing remote viewing services, it is quite possible that the remote viewer could remote sense the target using the senses of the magnetospheric self.

LS: *How do you interpret the massive data fragmentation and plurality of sensory modalities characterizing the typical RV signal? What about the phenomenon of bi-location?*

MP: The brain processes information by splitting it into simple "features", like edges, corners, simple movements,... These features are scattered around the brain almost like in random access memory and only the sensory representations at the magnetic body bind appropriate features to given point of magnetic canvas so that the soup of features organizes to a perceptive field.

In the case that the target is another person, data fragmentation could mean that magnetospheric self entangles with various mental images in brain so that individual "features" rather than the well-organized sensory representation at the magnetic body is seen. In the case of a non-living target the organization into perceptive field is probably absent in any case.

If the sharing of mental images occurs very intensely it can lead to bilocation. Even almost total masking of the ordinary contribution to sensory experience is possible. Hallucinogenic experiences, for instance those reported by Terence MacKenna, indeed involve a sudden replacement of the everyday

sensory reality with a new one.

LS: *Gariaev's work with modulated laser irradiation of DNA has yielded some fascinating insights into the possibility of non-local, non-canonical (codon-based) genetic regulation, possibly via large-scale biophoton and radiowave interference grids leading to the idea of an electromagnetic holographic blueprint for living organisms. What is the significance of his results for your model and how do you envision the hierarchy of morphogenetic and regulatory control systems in living organisms?*

MP: Gariaev's work provides an important bit of information (very many bits actually!) in an attempt to concretize the view about many-sheeted quantum bio-control and might turn out to be a convincing proof of many-sheeted spacetime concept. A decisive input for the model of quantum homeostasis came from Cyril Smith's lectures about water memory and homeopathy at the CASYS′2001 conference. The basic observation is that certain frequencies seem to code for the effects of the homeopathic remedy and that these frequencies appear in pairs of low and high frequencies which appear in constant proportion.

This can be understood in TGD framework as follows. When ions "drop" from (say) atomic spacetime sheets to some larger spacetime sheets (say magnetic flux tubes), the difference of energies is emitted as radiation. Zero point kinetic energy at small spacetime sheets is the dominating contribution and means that the radiation has relatively high energy and thus frequency (for instance, .5 eV for a proton dropping from atomic spacetime sheet). At magnetic flux tubes the dropped ions are in excited magnetic cyclotron states which decay by emitting cyclotron radiation at low frequencies. The "sensory" part of EEG re! sults in this manner. The ratio of high and low frequencies depends on the strength of the magnetic field and the p-adic length scale of the spacetime sheet from which the ion dropped and tends to have discrete values.

In particular, visible light (as in Gariaev's experiment) can "kick" charged particles from magnetic flux tubes to smaller spacetime sheets, from which they can drop back. In this process other ions at the magnetic flux tube can drop to larger magnetic flux tubes and emit low frequency radiation in this process.

Magnetic flux tubes form in living matter a hierarchy with magnetic field strengths varying as 1 over p-adic length-scale squared. Thus a low frequency radiation results with frequencies which are differences of harmonics of the cyclotron frequencies at the two magnetic flux tubes involved. This prediction is quantitative and testable and on the basis of a rough inspection of the frequency spectra reported in Gariaev's paper (1) the explanation might work.

The band structure of EEG reflects in TGD the periods of the periodic table and also the radiowave spectrum should exhibit scaled-up version of the band structure. Also many-sheeted laser action becomes possible if the frequency of visible light is tuned so that it is just enough to kick a charged particle to the smaller spacetime sheet. The frequency of the coherent light used in Gariaev's experiment corresponds to this kind of frequency. The dropping of the charged particle generates radiation at same frequency and many-sheeted laser action results, since the already existing coherent photons increase the dropping probability and "stimulated dropping" results. Also many-sheeted radiowave laser is possible and biosystems are expected to contain a fractal hierarchy of many-sheeted lasers.

The notion of conscious hologram might make it possible to achieve a unified view about how homeostasis as many-sheeted ionic flow equilibrium operates. Many-sheeted laser mechanism is only one important element of the picture. Leakage of ions to atomic spacetime sheets and resulting dissipative self orga-

nization; time reversal of this process h! aving interpretation as a fundamental healing process and implying a breaking of the second law of thermodynamics below the relevant p-adic time scale; MEs acting as Josephson junctions and controlling generation of nerve pulses and EEG (EEG should have fractal generalization): these are some facets of the quantum biocontrol.

Also the notion of many-sheeted DNA is important and means that DNA controls the development of the organism in wide range of p-adic length and time scales by generating coherent radiation patterns representing the template for the development of the living system as a fractal hierarchy of 4-dimensional holograms. The notion of field body implies that this hologram-like structure is of astrophysical size with light lifetime providing natural time scale.

LS: *This is probably the most dreaded question for a theoretician - but is your model falsifiable? Are there conceivable physical tests that could definitely validate (or disprove) your theory? How about quantitative predictions - any corroborating data so far?*

MP: Over the past 24 years I have practically gone through the whole physics in order to relate TGD to the existing theoretical and experimental reality. The most impressive success of TGD is the model for the masses of elementary particles based on p-adic physics. Elementary particle mass scales reduce to number theory and correspond to p-adic length scales associated with certain preferred primes $p \simeq 2^k$, k prime or power of prime. The predictions are exponentially sensitive to the value of k so that the success of the model is either a probabilistic miracle or the basic assumptions are correct. The most important p-adic length scales of elementary particle physics correspond to Mersenne primes and so called Gaussian Mersennes. Remarkably, all p-adic length scales between cell membrane thickness of 10 nm and cell size of 2.5 micrometers (length scales associated with the winding hierarchy of DNA!) correspond to Gaussian Mersennes: this is a number theoretical miracle. It would seem that the miracle of life relates closely to a a number theoretical miracle.

The predictions allowing to falsify the theory most convincingly appear at the level of fundamental physics. Symmetries fix in a highly unique way the elementary particle spectrum in all unified theories. TGD predicts that the symmetries of the elementary particle physics are essentially those of standard model. Discovery of elementary particles having quantum numbers which do not conform with those predicted by standard model can kill TGD. There are also important deviations from the standard model and the failure to observe them could also mean an end for TGD. Fortunately, there is a steadily increasing list of anomalies explained by TGD.

The predictions of spin glass degeneracy (macrotemporal quantum coherence) and of topological field quantization (superconductivity in astrophysical length scales), will sooner or later mean a breakthrough or the end of TGD since they allow concrete quantitative quantum models not only for biocontrol but also for remote mental interactions.

The latest outcome of the number theoretic approach are genuine measures of information. Number theoretic entropies defined for systems for which entanglement coefficients are algebraic numbers can have negative values and thus have interpretation as positive information. One could characterize living systems number theoretically as systems for which entanglement coefficients are algebraic numbers. Quantum computation-like operations are made possible by macrotemporal quantum coherence: quantum states are no longer fragile since nature itself stabilizes them. The new view about subsystem forced by many-

sheeted spacetime predic! ts the possibility of sharing and fusion of mental images. All these predictions are testable killer predictions.

LS: *What are some of the fields to which you believe your model could make major contributions (i.e. neurophysiology, q-computing, parapsychology, etc)*

MP: Reductionism is practically always taken as an axiom of physics. The basic implication of TGD is that reductionism is broken at all length and time scales. New phenomena are predicted in all branches of physics, biology, neuroscience, parapsychology... Many-sheeted spacetime provides detailed models for several anomalies associated with free energy phenomena and these models should help to development new energy technologies. Conscious quantum computation type processes (quantum problem solving might be a more appropriate term) with number theoretical information measures replacing the Shannon information is second technological implication.

The notions of conscious hologram and many-sheeted ionic flow equilibrium promise a unified description of a large class of apparently unrelated phenomena like homeostasis, homeopathy, sensory representations, and remote mental interactions.

In neuroscience the TGD based model for the quantum control of EEG and nerve pulse is one important application.

LS: *What, in your opinion, are the most promising experimental and theoretical directions to be followed toward a unified theory of mind and matter?*

MP: My answer is necessarily very TGD-centered. I think that it would be worth seeing whether the concepts inspired by the TGD approach could allow us to understand consciousness, living systems, and remote mental interactions qualitatively. On the experimental side the strategy would be to test the basic notions.

a) Experimental tests for the notion of many-sheeted space-time, topological field quantization, and for the prediction that non-atomic space-time sheets act as superconductors even in astrophysical length scales.

b) Experimental demonstration for the presence of various physical signatures for the transfer of ions between spacetime sheets and for the breaking of second law below the p-adic time scale characterizing the system.

c) Experimental tests for the notions of magnetic body, magnetospheric consciousness, and for multi-brained collective selves. The work of Mark Germine is very encouraging in this respect.