Comments about human enhancement project (HEP)

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Contents

1 Introduction

I the sequeI will go the article section by section and represent both general comments and also comments from TGD point of view - you can freely skip them since they might be difficult to follow. The general comment are just my opinions, not meant to be taken as general truths.

The topics discussed is very interesting. My own understanding about details of brain science is of course that of well-educated layman.

My basic criticism is related to the proposals involving the idea about variation of light-velocity due to gravitational effects as GRT describes them. In GRT one does not have any standard with which to compare light velocity so that its is very difficult to give content to the statement that metric effects change the light velocity. Also the deviations of the metric from flat Minkowski metric in GRT Universe are extremely small.

I do not either see nerve pulse velocity as the dominant factor but this is only my view based on my own vision about brain.

The experiment showing that the knowledge about participation to scavenger hunter task to be done improved the estimates about the success in task is excellent challenge for quantum consciousness theorists.

Challenging of the arrow of time is also key elemnts in TGD inspired theory of consciousness.

The idea about effective hyperbolic geometry assigned to brain by statistical considerations is very interesting from TGD point of view and wrote a little article about this.

My sincere hope is that these comments are of help.

1.1 List of typos

I found some little typos and thought that it might be useful to list them with proposed corrections.

- special gravity → special relativity. Introduction
- human understanding from → human understanding of? Introduction
- for Minkowski, space time is considered as a continuous parameter→ for Minkowski space time time is considered as a continuous parameter Sc 2.1.2
- to partially relavistic → to be partially relativistic . Sc 2.12
- 380 nm (red limit) to 760 nm(the violet limit) →380 nm (violet limit) to 760 nm (the red limit) : Sc 3.3

2 Sc 1 Undersanding of HO in biological physics

In the beginning some general comments about perception are represented.

The list of basic notions is following.

- Boundary as "skin" of the organism or organelle.
- Sensory organ.
- Sensory processing. Cognition.
- Measurement at basic level as quantum measurement producing eigenstate of observables whose eigenvalues characterize state.
- Observation and recognition are distinguished. How closely the notion of attention relates to recognition.

Remarks:

1. The restriction to human observer. Should one take a more general viewpoint. Consciousness theories in which panpsychism is assumed. Even in neuroscience.

2. Problems of quantum measurement theory. Observer still and outsider. Theory of conscious observer required. What produces the inside-outside division?

3. The role of sensory organs in perceptions. Brain or sensory organs the seat of sensory qualia.

4. Cognition. No physical correlates known.

2.1 Sc1.1 Potential enhancement of human perception and cognition

Here potential examples of potential selective enhancement (SE) of human perception and cognition are discussed

Selective enhancement of sensory perception (SSE).

- Pre-seismic precursors would represent SE of electromagnetic perception (SEE).

  Comment: The fact that em waves precede rather than follow these events suggests a time anomaly. In TGD framework earthquakes and volcano eruptions could correspond to macroscopic quantum jumps changing the arrow of time at the level of MB and inducing its effective change at the level of ordinary visible matter [L4]. Change of the arrow of time involved.

- Place- , time- space-time cells in hippocampus and synethesia are mentioned. Here MB could play a key role.

- IR vision. Two-photon chromophore isometrization. Ocular injectable photoreceptor binding nano-antennae: NIR light patterns. Tested for lab animals. Even patterns can be recognize.

- Cognitive and sensory feats of idiot savants. Sensory memories.

  Comment: in TGD framework sensory memories, dreams, hallucination, etc.. would represent communications from MB or brain to sensory organs. Usually this communication is only feedback allowing to build sensory percepts. Imagination would be this kind of communications which would not get down to to sensory organs.

Selective cognitive enhancement (SCE). Idiot savants are able to perform number theoretical feats. Decomposition of big integer to primes is one such feat. In TGD framework one important class of SSFRs would be SFRs in the group algebra of Galois group the extension of rationals assignable to the polynomial determining characterizing space-time surface. They would be accompanied by the decomposition of the integer defining the dimension $n = h_{eff}/h_0$ of the extension to prime factors. Could idiot savants "see" this process.

Superior pattern processing

As noticed, in TGD framework sensory percept can be regarded as artwork. An interesting possibility to understand the different between holistic and linear cognitive processing would be based on the character of neural networks involved. The networks would be associated with flux tube networks. Linear, language like processing would favour linear 1-D networks. Holistic, geometric processing would favor 2-D and 3-D networks. The latter would be stable against splitting of flux tube contacts/axonal connections- this would explain why Alzheimer affects linear but not so much holistic aspects of cognition [L9].

2.2 Space-time intervals, light-cone and consciousness

Light-cone causality in special relativity (SR) is discussed in standard approach introduced by Einstein, that is at classical particle level identifying particles as world lines.

Remarks:

1. A more abstract approach relies on causality of field equations formulated as Lorentz/Poincare invariance. The violation of causality would mean tachyons. In Higgs mechanism free Higg would be tachyon but Higgs mechanism makes it non-tachyonic.

2. The problem of two times.

Comment: In TGD framework one must distinguish causality in this sense (causality of geometric time) from the causality of free will with subjective time assigned with the sequences of SSFRs.

3 Sc2. Observer, general relativity (GRT), quantum physics

3.1 Sc2.1 Observer in GRT

Insertion at the end of this section.

This picture relies on the notion of classical point-lile particle. A more abstract approach applying in field theories relies on causality of field equations formulated as Lorentz/Poincare invariance. The violation of causality would mean tachyons. For instance, In Higgs mechanism free Higg would be tachyon but Higgs mechanism makes it non-tachyonic.

3.1.1 Sc2.1.1. Light-cone model for observer is summarized and generalizes the special relativistic model

3.1.2 Sc2.1.2 Observer and possibility predict an event on the future light-cone

Further points.

1. Quantization of time is mentioned.

   The notion of time quantum at fundamental level is not part of standard picture.

2. It is speculated that the change of the space-time metric could affect the past-future relationship. This proposal is problematic since in classical GRT framework there is no reference metric with which to compare!

3.1.3 Increase of conduction velocity and of maximal signal velocity as cause of enhancements

Information exchange velocity is proposed as a possible mechanism of enhancements. The velocity of nerve pulse conduction is proposed as a factor possibly explaining phenomena like increase sensory acuity in given sensory channel in presence of activity in other sensory channels.

Possible examples.

- Stimulation of modality synergizes discrimination of other modality.
- Pharmacological drugs in specific brain areas.
- Selective response of time- and space cells. Context dependence.

3.1.4 TGD inspired comments

1. Comments about the mentioned time quantum.

   - Subjective time and geometric time. SSFRs correspond to time chronons ΔT identifiable as changes of the distance between tips of CD. T increases in statistical sense. Quantization of perceived clock time. No quantization at the level of geometry.
   - Cognitive representations give rise to a discretization of space-time. This represents finite measurement and cognitive resolution and does not correspond genuine quantization.
   - Very special moments in the life of self. Correspond to special values of M^4 time as roots of polynomials. Could be associated with phase transition like phenomena.

2. Concerning the proposed dependence of maximal signal velocity on metric. As noticed, in GRT framework there is no reference with which to compare. Maximal signal velocity corresponds to light-like geodesic.

- In TGD framework space-time is surface in $M^4 \times CP_2$ and the flat metric of Minkowski space M^4 serves as a universal reference metric with one can compare. Typically the maximal signal velocity along space-time surface is smaller than in M^4.
- CP_2 length scale in turn gives universal meter stick. M^4 also provides preferred coordinates: in general relativity general coordinate invariance allows all coordinates and in general case there are no preferred coordinates. Besides this H provides well-defined conserved quantities.
- In TGD M^4 metric serves as a reference metric. Light-velocity in Minkowskian regions of space-time surface smaller than in M^4. In regions with Euclidian signature - which are also possible - one cannot speak about light-velocity and signals. The interior of the space-time surface for elementary particle is basic example. The orbit of the 3-surface defining elementary particle however serves as a signal.

3. About the possible role of nerve pulse conduction velocity.

   - Nerve pulse transition self-organization process analogous to burning. It could be induced by Sine-Gordon wave representing genuine signal propagation.

     The real function of nerve pulse transmission would be building of communication pathway along which dark photons would carry information with light velocty.

     Conduction velocity might not be the dominating factor. Its increase would make faster the initiation of communications with light-velocity.

4. In TGD framework a more plausible reason for enhanced cognition and sensory perception be due to the generation of phases with larger h_{eff}. Requires metabolic energy feed.

   Larger h_{eff} implies quantum coherence in longer scale and improveds the precision of percetion since cognitive representations become more accurate - the number of space-tme points having imbedding space coordinates in extension of rationals increases with the dimension $n = h_{eff}/h_0$ of extension.

   Sensory and cognitive enhancement would require generation of phases with larger value of h_{eff}. This requires quantum criticality - essentially generation of more sensitive sensory receptors - and feed of metabolic energy.

5. The possible role of hyperbolic geometry is mentioned. This inspired me to write an article about the role of hyperbolic geometry in TGD framework as a framework for cognitive representation at magnetic body [**?**]. Highly unique cognitive representations would be in question. Cognitive representation would form a hierarchy and layers of MB with larger values of h_{eff} would correspond to more abstract cognitive representations.

3.1.5 The experiments of Armor and Sacket

Internal neurocognitive environments of human subjects influence the predictions of near future evens. Experiment of Armor and Sackett involved scavenger hunter task. Two situations: the person to participate the task was told or not told that he would participate the task and also asked for opinion and personal success. It turned out that the estimates were considerably better when person was told about participation.

Was there precognition about the real performance of the task and the knowledge about participation would have provided this knowledge. Could the estimate about the participation improved the estimate about performance.

Remarks:

1. Possible quantum explanation. State function reduction answers a question and provides information: Schrödinger cat as example. Now information was received. It should have been accompanied state function reduction, projection of an entangled state to a product state reducing the number of possibilities.

2. Reversal of time arrow of time?

3.2 Sc2.2 Quantum physics

3.2.1 Sc2.2.1. QP and observer/interpretation issue

The idea about observer dependent localization in space-time is discussed and the notion of Causal Reference Frame (CRF) is introduced. Te independence on observer would requires that can choose the CRF globally. For instance, no closed time-like geodesic would not be allowed. The proposal mentioned is that one should give up observer independency.

In GRT the notion of coordinate frame is problematic since by the loss of Poincare invariance the notion of conserved energy is lost. In SRT rest system is unique apart from rotations. In GRT one cannot identify rest system unless one approximates GRT wth SRT and in practice uses Newtonian theory of gravitation as first approximation. The local geodesic coordinates are defined and rely on four ortogonal geodesics starting from the point considered.

TGD based comments.

1. In TGD framework the problem can be seen as being caused by wrong view about time. In TGD framework one must distinguish between subjective and geometric time. Subjective time corresponds to sequence of SSFRs and each conscious observer has its own subjective time. This applies to all systems, not only HOs. Subjective time ordering is directly experienced. The experienced order of SSFRs corresponds to that of geometric time values only statistically so that identification of the two times is not possible: the two times are however strongly correlated in ZEO. Time ordering anomalies are predicted.

   For instance the chronon of sensory experience about .1 seconds. Below this time scale the time order of events does not make sense. Even longer uncertainties are possible and this might be testable. For instance, the ordering of letters typed at computer can vary. This might have a mundane explanation but could also reflect different orders of geometric and subjective time.

2. p-Adic physics could serve as a model for the time ordering anomalies resulting when geometric time is identified as subjective time. p-adic numbers are not well ordered and the p-adic analog of time coordinate could serve as a statistical model for subjective time for a system characterize by p-adic prime p. Its mapping via canonical identification $\sum z_n p^n \to x_n p^{-n}$ to real time coordinate would not preserve time ordering in strict sense.

3.2.2 Sc2.2.2. QP, interplay between observation and interpretation

Von Neumann's view is that consciousness causes state function collapse. This leaves conscious entities outsiders to the physical world.

In TGD inspired theory of consciousness conscious observer becomes part of the Universe. Collapse of state function is the moment of consciousness identified as state function reduction (SFR) having interpretation as quantum measurements. The are two kind of SFRs: BSFR and SSFR.

3.3 Sc2.3 Observer and possibility to predict...

There is evidence for precognition. The proposal is that a transfer of information with speed larger than c could be explanation. Changes of c are suggested to be caused by changes of the space-time metric. I already explained why I am a little bit skeptic about this: there is not manner to compare the metric to any standard metric in GRT framework.

TGD view:

1. In TGD framework precognition would be made involve macroscopic quantum coherence and quantum entanglement and require also ZEO allowing the propagation of signals in both time directions. The arrow of time would change in BSFR. In neuro science motor actions would correspond to BSFRs changing the arrow of time and sensory perceptions to SSFRs.

2. One could see to geometric future/past by sending a future-/past- signal which is time reflected. Memory and precognition could be seen as this kind of time reflections. Seeing in time directions. The reflection would be BSFR.

3. This allows to overcome light-velocity barrier and communications with arbitrary distance space-time regions in principle become possble.

4 Sc3. Theoretical consequences of some HEPs. Definition of HOs, second law, negentropy

4.1 Sc3.1 Challenges to the definition of observers

The definition of human observers is challenges using a scenario involving Bob and Bobbie which are identical twins. Bob lives in the island and Bobbie has moved away.

Sensitivity for future events is taken as example. Sensory percepts allowing to predict earth quake like events is considered. Native people like Bob seem to be able to predict these events and perception of ELF em radiation created by these events is taken as an explanation. Non-natives like Bobbie do not have this ability. This is taken as a challenge for the notion of observer.

One could criticize the thought experiment.

1. Bob and Bobbie are assumed to be identical twins and that identical genes make them identical observers. To me this looks like exaggeration of genetic determinism. Also environment and personal history affect the perception. For instance, by listening to music, one can develop skills in hearing and analyzing what is heard.

2. Also the attentiveness, readiness to perceive something, is very significant. What are the correlates of attention is of course poorly understood since consciousness is poorly understood.

TGD view about experiment would involve the notions of MB, of dark matter in TGD sense, and ZEO.

1. The first new element is MB carrying dark matter in TGD sense. Magnetic flux tubes are ideal antennas and could make possible electromagnetic perceptions. Magnetic flux tube connections would serve also as correlates of attention. In the model for water memory U-shaped flux tubes serving as tentacles would reconnect with those of invader molecule and form bridges formed by two flux tubes between the water's MB and target molecule. Resonance for dark cyclotron photons would serve as a mechanism of attention and recognition: tuning to the same wavelength would be the mechanism.

2. Dark photons with large h_{eff} transforming to ordinary photons identifiable as biophotons in visible and UV (at least) could make possible em perception in the entire wave legth range. Also magneto-perception becomes possible since flux tube antennas can serve also a compass: this leads to a model for the ability of birds to navigate in Earths' magnetic field [L6].

   Bob would develop this kind of flux tube system allowing to perceive the em radiation preceding the earthquake.

   By previous argument the magnetic flux tubes of water serving as antennas give rise to water memory. Also now the MB of biological water could be involved and develop flux tubes having cyclotron frequencies at the frequencies associated with earthquakes.

3. In TGD framework earthquakes would be macroscopic BSFRs changing arrow of time at some layers of MB [L4]. The em radiation generated by earthquake would propagate to geometric past. Time reversal at the level of MB would induce effective time reversal at the level of ordinary matter. Are the perceived signals time reversed signals generated by BSFR?

4.2 Sc3.2 Challenges to the definition of past and future

The following topics are discussed.

1. Conscious and unconscious perceptions.

   Comment: TGD view predicts self hierarchy. Mental images would correspond to sub-selves. Sub-sub-selves would be experienced only as ensemble averages, one might say. Unconscious perceptions would correspond to conscious perceptions below the level assignable to sub-selves.

2. Second law of thermodynamics is challenged.

   Comment: TGD predicts both arrow of time and second law is generalized so that it applies in both arrows of time. Understanding of self-organinization in terms of second law in reversed arrow of time is one implication.

3. Negentropic entanglement (NE). NE is not possible in standard physics since entanlement entropy is always non-negative and characterizes the uncertainty about the state of either entangled system.

   Comment: NE is possible in p-adic physics as correlate for cognition, imagination, and intentions. For entanglement with entanglement coefficients in any extension of rationals, one can defined also p-adic analogs of Shannon entropy and these can be negative. The interpretation could be as negentropy characterizing the information about entire entangled system rather than describing information loss about the state of either entangled system.

4.3 Sc3.3. Challenge of different visual capacity of Os

IR vision

4.4 Sc3.4. Challenge of different EP of Os

4.5 S4. Hypothetical example of opportunities for selective HEPs

HEPS improving human understanding of...? HEPs challenging past interpretations and implications of physics.

5 Appendix: TGD based view about perception

There has been several references to TGD based view about consciousness, quantum biology, and perception. TGD view relies on new view about space-time and electromagnetic fields implying what I call many-sheeted space-time and the notion of field body/magnetic body, which would play central role in biology. New space-time concept would involve number theoretical generalization lead to a proposal for the space-time correlates of cognition. The measurement problem of quantum theories forces modification of standard ontology to what I call zero energy ontology (ZEO) leading to a new view about the relationship of experienced time and geometric time of physicist. ZEO predicts also the occurrence of time reversals reducing self-organization to a dissipative dynamics in non-standard time direction. Number theoretic approach leads to a prediction of phases of ordinary matter labelled by effective value $h_{eff} = nh_0$ of Planck constant giving rise to macroscopic quantum phases identifiable as dark matter and inducing the coherence of living matter.

5.1 TGD based view about space-time

[L1] `http://tgdtheory.fi/public_html/articles/WhyTGD.pdf`

5.2 TGD and quantum theory

ZEO and quantum measurement as moment of consciousness. BSFR and SSFR. Arrow of time. Self hierarchy. Induced arrow of time. Two times, two causalities. Time quanta and SSFRs.
`http://tgdtheory.fi/public_html/articles/zeoquestions.pdf` `http://tgdtheory.fi/public_html/articles/heffselforg.pdf`

$M^8 - H$ duality. Special moments in the life of self.
`http://tgdtheory.fi/public_html/articles/M8Hduality.pdf` `http://tgdtheory.fi/public_html/articles/SSFRGalois.pdf`

5.3 ZEO based quantum measurement theory as theory of consciousness

Quantum measurement is certainly the fundamental element of perception. The standard quantum measurement theory is however plagued by paradox: the non-determinism of state function reduction is not consistent with that of Schrödinger equation and more generally, unitary time evolution. There is also problem with the notion of time: experienced time and the geometric time of physicist have very different properties and cannot be identical as however assumed.

Zero energy ontology (ZEO) based quantum measurement theory solves the problem.

1. Zero energy states can be seen either as pairs of states analogous to initial and final states of deterministic time evolution or as superpositions of classical time evolutions connecting these states. Initial value problem transforms to boundary value problem with boundaries of space-time surface at opposite boundaries of causal diamond (CD). The time evolutions correspond to preferred extremals satisfying infinite number of additional conditions making the unique once initial and final 3-surfaces are fixed.

2. Quantum jumps replace as superposition of preferred extremals with a new one so that the determinism of classical time evolution is respected and the basic paradox is solved. Preferred extremals are analogs of programs in computer sciece, of behaviors in neurosciece, and of functions in biology.

3. There are two kinds of state function reductions (SFRs). "Small" SFRs (SSFRs) and "big" SFRs (BSFRs) [L8] (`htp://tgdtheory.fi/public_html/articles/SSFRGalois.pdf`). BSFRs correspond to ordinary state function reductions and in these the arrow of geometric time changes. BSFR is interpreted as death of self and rits eincarnation with opposite arrow. This in universal sense. The self assignable to SSFRs dies and and reincarnates but with opposite arrow of time [L7] (`http://tgdtheory.fi/public_html/articles/qmeasurenumber.pdf`).

   In SSFRs members of states at "passive" boundary of CD are not changed but active boundary and states at it change. Statistical sense active boundary recedes from passive one. The distance between tips identifiable as clock time (geometric time) and correlating with subjective time as sequence of SSFRs increases.

   The experiments of Minev et al give direct support for ZEO based quantum measurement theory [L3].

4. ZEO leads also to a new view about self-organization [L5] (`http://tgdtheory.fi/public_html/articles/heffselforg.pdf`). Self-organization involves generation of coherence in longer length and time scales and requires energy. In ZEO self-organization reduces to dissipation in opposite arrow of time (second law applies now in opposite arrow of time). Dissipation of energy corresponds in standard time direction extraction of energy from environment - feed of metabolic energy. Generation of structures/gradients (temperature, concentrations) correspond to their disappearance in opposite time direction. Biological systems would be basic example of this.

5. Under what conditions BSFR does take place? I have proposal several ad hoc answers to this question. One can however adopt an empirical approach and look what happens in biological death and birth of a biological organism, which should now occur in time reversed sense. The metabolic energy feed to the system is needed to increase the average value of h_{eff} or at least to maintain the distribution of effective Planck constants $h_{eff} = n \times h_0$ with n identifiable as a dimension for an extension of rationals and a measure for algebraic complexity an kind of "IQ". BSFR could occur when metabolic energy feed is not enough to guarantee increase of CD size correlating with the increase of average h_{eff}. Time reversal in BSFR would solve the problem. This approach suggests a rather detailed view about what might happen in BSFR [**?**] (`htp://tgdtheory.fi/public_html/articles/whendeath.pdf`).

5.4 TGD and biology

MB and h_{eff} hierarchy. Self-organization, metabolic energy feed. Induced coherence. Attention and flux tube contacts. Reconnections. Immune system.

`http://tgdtheory.fi/public_html/articles/philosophic.pdf`

5.5 Sensory perception

Attention as a prerequisite. Sensory organs carriers of qualia. Dark photons and bio-photons. The role of nerve pulse. Conduction velocity determines how long it takes time before communications by dark photos can begin. Sensory percept as artwork.

http://tgdtheory.fi/public_html/artcles/pulse.pdf http://tgdtheory.fi/public_html/articles/dmtpitneal.pdf http://tgdtheory.fi/public_html/articles/emotions.pdf

5.6 p-Adic physics, adelic physics, and cognition

Imagination as partial sensory experience. Sensory memories. Negentropic entanglement. Increase of h_{eff}.

Adelic physics. Extensions of rationals. h_{eff} hierarchy. Enhanced cognition, sensory experience, etc.. h_{eff} increases. Cognitive representations. Acuity of sensory experience and cognition.

http://tgdtheory.fi/public_html/articles/adelicphysics.pdf http://tgdtheory.fi/public_html/articles/SSFRGalois.pdf http://tgdtheory.fi/public_html/articles/hyperbolicbrain.pdf

5.7 The view about perception inspired by zero energy ontology (ZEO)

I add here the TGD inspired view about perception. Reader can of course skip it. The pilosophical ideas behid TGD inspired biology and neurosciece are described in [L2] (http://tgdtheory.fi/public_html/articles/philosophic.pdf).

1. Boundary of system, "skin" would correspond to that of space-time sheet. It would be boundary of the projection of 3-surface in $M^4 \times CP_2$ to M^4 rather than genuine boundary of 3-surface.

2. Sensory organ. In neuroscience one assumed that sensory qualia are produced at the level of brain. In TGD sensory organ is the seat of qualia. New view about time allows to circumvent the obvious objections such as phantom limb. This resolves the basic problem of neuroscience due to the fact that brain area associated with various sensory qualia do not seem to differ in any manner.

3. Sensory processing. If the sensory organs are seats of the qualia, sensory processing must involve feedback loop between sensory organ and brain and perhaps even magnetic body. Brain (perhaps MB) would provide feed back as virtual sensory input and the process would to a standardized sensory mental image. The communication by nerve pulses is quite too slow for this purpose. TGD proposal is that dark photons propagating parallel to magnetic flux tubes parallel to axons are the real communication too. Bio-photons in energy range of visual and UV photons would result as dark photons transform to ordinary photons (h_{eff} is reduced to h).

   One can say that sensory percept would is an artwork. There the assumption that identical genomes give rise to identical perceptions would not be realistic. Every organism is an artist.

   The function of nerve pulses would be to connect the flux tubes associated with axons of pre- and post-synaptic neuron to single flux tube so that dark photon signals can propagate. This would be like opening communication channel in usual IT communications. Keeping it open all the time would cost too much energy. The increase of h_{eff} for ions associated with flux tubes might be also involved and indeed requires metabolic energy. Nerve pulses patterns would generate generalized Josephson radiation communicating sensory data represented by it to MB.

4. Attention would be part of recognition or perhaps the recognition. Attention has as correlate flux tube connection between the attending system and target of attention making possible flow of dark photons and supra currents. This would be true when the target is system of external world or sub-system of brain. The dynamic flux tube networks in which connecting flux tube means attention would be essential for brain functioning.

At molecular level the attention in this sense makes possible for water to recognize invader molecules using U-shaped flux tubes acting as tentacles and reconnecting with similar flux tubes of target molecule. This would also allow to build a magnetic representations for the cyclotron frequency spectrum of these molecules. This would give rise to water memory and primitive immune system.

5.8 Precognition

Time reversed selves. Earth quakes as macroscopic quantum jumps in ZEO. Signals backwards in time. These would be perceived by time reversed subselves.

`http://tgdtheory.fi/public_html/articles/zeoquestions.pdf` `http://tgdtheory.fi/public_html/articles/heffselforg.pdf`

5.9 The feats of idiot savants

Sensory memories and perfect cognitive representations. Cognitive feats such as decomposition of integer to primes. SSFRs

`http://tgdtheory.fi/public_html/articles/SSFRGalois.pdf`

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