Deconstruction and reconstruction in quantum physics and conscious experience

M. Pitkänen Email: matpitka6@gmail.com. http://tgdtheory.com/.

June 20, 2019

Contents

Abstract

Deconstruction and reconstruction are notions associated with philosophy of literature. architecture, and other arts. They are realized also in neuroscience in the construction of percepts by first analyzing the sensory input and then rebuilding it to full percept by association process. Analogous procedures appear also in computer programming. The quantal counterparts for the neuroscience variants of de- and reconstruction appear naturally in TGD inspired quantum theory of consciousness, and the analog of deconstruction can be seen even in condensed matter physics. To me these notions look fundamental and could be part of the Great Narrative of quantum physics, which is definitely not dead! In this article these notions are discussed in rather speculative spirit.

1 Introduction

Deconstruction means roughly putting something into pieces. One could also speak about deconstruction followed by a reconstruction since deconstruction creates the impressions that something is just destroyed. Often deconstruction is thought to involve the reconstruction. This process is applied in deconstructivistic architecture (https://en.wikipedia.org/wiki/Deconstructivism) as one can learn by going to Wikipedia and also cubism brings in mind this kind of approach. In this process one organizes typical features of given style in new - one might even say "crazy" manner. There can be even a kind of social interaction between buildings: as if they were communicating by exchanging features.

Postmodernism is a closely related movement and claims that truths are socially constructed: great narratives are dead. Nothing could irritate more physicist who has learned how much mistakes and hard work are needed to distill the truth! Everything does not simply go! On the other hand, one can argue the recent sad state of super string theories and frontier theoretical physics in general suggests that postmodernists are right. Superstrings and multiverse are definitely purely social constructs: they were the only games in the town but now American Mathematical Society warns that super string theoreticians are spoiling the public image of science. Multiverse lived only few years. Certainly one great narrative - the story or reductionism and materialism thought to find its final culmination as M-theory - is dead. It is however nonsense to claim that all great

narratives are dead. That telling the alternative great narratives in respected journals is impossible does not mean that they are dead!

But is not wise throw the big ideas of deconstruction and reconstruction away. Rather, one can ask whether they could be made part of a new great narrative about physical world and consciousness.

2 Deconstruction and reconstruction in perception, condensed matter physics and in TGD inspired theory of consciousness

Deconstruction and reconstruction appear in the construction of percepts, in condensed matter physics, and are also part of TGD inspired theory of consciousness.

2.1 Perception

The very idea of deconstruction in architectural sense is highly interesting from the perspective of both quantum physics and consciousness.

The buildup of our perception involves very concretely deconstruction process. First the sensory input is decomposed into features. Edges, corners, positions, motions analyzed to direction and velocity, colors,... Objects are replaced with collections of attributes: position, motion, shape, surface texture, color,.... Deconstruction occurs at lower cortical layers. After this reconstruction takes place: various kinds of features are combined together through a mysterious looking process of binding - and the outcome is a percept.

Reconstruction can occur also in "wrong" manner. This occurs in hallucinations, delusions, and dreams. Humour is based on association of "wrong" things from different categories together. Synesthesia involves association between different sensory modalities: note with a given pitch have characteristic color or numbers correspond to colors or shapes. I remember an article telling about how subject persons in hypnosis can experience what circle with four corners looks like. Some attribute can be lacking from the reconstruction: person can perceive the car as object but not its motion. Car is there now. Moment later it is here. Nothing between.

Also non-standard reconstructions are possible. Could these non-standard reconstructions define a key aspect of creativity. Could reconstruction represent in some lucky situations new idea rather than hallucination or delusion?

For few years ago I listened a radio document about a professional, who builds soundscapes to movies and learned that the construction of soundscape is deconstruction followed by reconstruction. One starts from natural sounds but as such they are not very impressive: driving by car over some-one does not create any dramatic effect- just "splat" - nothing else. Thisit is so non-dramatic that it can be used to create comic. In order to cure the situation the real sounds are analyzed to features and then reconstructed by amplifying some features and by throwing away the unessential ones. The output sounds much more real than the real input. Of course, actors are masters of this technique and this is why videos about ordinary people doing something funny is like looking autistic ghosts. And if you look at the collection of modules of video game you see modules with name "Aargh", "Auch", "Bangggg", etc..

Association is the neuroscientist's key notion and allows to get an idea about what happens in reconstruction. Reconstruction involves association of various features to form the final percepts. First this process occurs for various sensory modalities. Sensory percepts from various sensory modalities are then combined to full percepts in association regions.

But what associations are at deeper level. What features are? Heretic could ask whether they could correspond to conscious experiences not conscious to us but conscious at lower level. Reader probably noticed that reconstruction-deconstruction took place here: the student is not supposed to ask this question since the theories of consciousness for some funny reason - maybe a pure accident - almost as a rule make the assumption that consciousness has no structure- no selves with subselves with sub-selves with... How these features bind to our conscious percepts? Neuroscience alone cannot tell much about this since it is based on physicalism: "hard problem" serves the articulation of this problem.

The following considerations represent deconstructions and reconstructions, and I will not explicitly mention when this happens. I just warn the reader. Do not stop reading however!

2.2 Condensed matter physics

One must bring in some basic notions of quantum theory if one wants to reduce deconstruction and reconstruction to quantum physics. The key mathematical fact is that in quantum theory each particle in many-particle state corresponds to a tensor factor. This notion is very difficult to eplain without actually having a lecture series about quantum tneory but I can try.

1. The basic idea is that one can build Hilbert spaces by forming their tensor products of them. If you have Hilbert spaces of dimensions n_1 and n_2, the tensor product has dimension $n_1 \times n_2$. Hilbert spaces represent physical systems: say electron and proton. To describe word consisting of proton and electron you from the tensor product of these Hilbert spaces. This is like playing with legos.

   Now I must be honest, I was cheating a little bit. Life is not quite so simple. One can also form bound states of two systems - say hydrogen atom from proton and electron, and the bound states of hydrogen atom represent only a sub-space of the tensor product. Connes tensor product is more exotic example: it represents only a sub-space of the entire tensor product: only certain kind of entangled states for which the composites are strongly correlated are allowed. As a matter fact, gluing the legos together creates strong correlations between them so that it serves as a good analogy for Connes tensor product and tensor product assignable to bound states.

2. Even elementary particles have several degrees of freedom -say spin and charge - to which one can assign Hilbert spaces decomposing formally into tensor product of Hilbert spaces associated with these degrees of freedom. Sub-space of the full tensor product is allowed, and one can purely formally say that elementary particle is a bound state of even more elementary particles. Somewhat like written word having meaning to us consists of letters, which as such represent nothing to us (but could represent something to lower level conscious entities). Could it be possible to apply deconstruction to elementary particles?

Now comes the surprise: condensed matter physicists have discovered deconstruction long time ago!

1. Electron in the valence band of conductor has three kinds of degrees of freeedom labelled by spin, charge and orbital state- state of electron in atom - characterizing the valence band. One can velocity to both spin, charge and orbital state. The state of electron decomposes in purely formal sense to a bound state of spinon, chargon, and holon. The question is whether one could have a situation deconstructing this bound state to its composites moving with different velocities. One would have effectively three particles and quantally three waves moving with same velocity. For free electrons obeying Dirac equation this is not possible. But this could be (and is!) possible in condensed matter. This deconstruction is mathematically like ionizing an atom: ion and electron are the outcome.

2. Instead of single wave motion there can be three free wave motions occurring with different velocities (wave vectors) corresponding to spinon, chargon and holon. In popular articles this process is called "splitting" of electron. This term is optimal choice if the purpose is to create profound mis-understandings in layman reader associating naturally splitting with a geometric process of putting tiny ball into pieces. As already explained, it is Hilbert space which is decomposed into tensor factors, not a tiny ball. The correlations between factors forced by bound state property are broken in this divorce beteen degrees of freedom.

3. What condensed matter theorist propose is roughly following. The consideration is restricted to effectively one-dimensional systems, call them wires. Atoms along line and electrons at atoms, which can be in conduction bands and give rise to a current. Electron has spin, charge, and orbital degrees of freedom if in conduction band and delocalized and thus shared by the atoms. The spin direction of the electron can vary along wire, and electron can excited

to a higher orbital in atom and this exciattion can also vary along wire. These degrees of freedom define tensor factors. Usually these degrees of freedom are bound to single entity free electrons and interacting electrons usually move as a single entity with charge, spin, and orbital excitation.

The holy trinity of charge, spin, and orbital degrees of freedom can be however split under some circumstances prevailing in condensed matter. The phase of the spinor representing electron can vary along wire and defines wave motion with some velocity/wave vector assignable with the ordinary electric current. The spin of electron can rotate at each point. Also the phase of this rotation can vary along wire so that a wave moving along wire with velocity different from that for charge: this is spin wave having as classical analog the rotation of bicycle pedals. If electron moves in a linear lattice of atoms, the orbital excitation can also vary along the wire and a third wave moving with its own velocity is possible. One has three free particle like entities moving with different velocities! This kind of waves are certainly not possible for the solutions of Dirac equation representing freely moving fermions and particle physicists do not encounter them.

4. These wave motions are different from the wave motions associated with phonons and magnons. For sound it is periodic oscillation for the position of atom, which propagates in sound wave. For magnon it is change of spin direction which propagates and defines a spin 1 collective excitation. Spinon as a quasiparticle has spin 1/2 so that spinon and magnon are different things. Spinon is formal constituent of electron made visible by the condensed matter environment. Magnon is collective excitation of condensed matter system.

   Spin currents provide an example of a situation in which spin and charge currents can flow at different speeds and are becoming important in a new technology known as spintronics. Spin currents have very low resistance and the speculation is that they might relate to high T_c super conductivity.

From the articles that I have seen one might conclude that deconstruction is in practice possible only for effectively 1-dimensional systems. I do not see any obvious mathematical reason why the deconstruction could not occur also in higher-dimensional systems.

It is however true that 1-dimensional systems are very special physically and mathematically ans super string theorists know. Braid statistics replaces ordinary statistics at for them and this brings in a lot of new effects. Furthermore, 2-D integrable gauge theories allow interactions as permutations of quantum numbers and lead to elegant models describing deconstructed degrees of fields as quantum fields in 2-D Minkowski space with interactions reducing to 2-particle interactions describable in terms of R-matrix satisfying the Yang-Baxter equations. It is difficult to say how much the association of deconstruction to 1-D systems is due the fact that they are mathematically easier to handle than higher-D ones.

The rise and fall of superstring models certainly was due to this technical easiness. I learned that the easiest manner to kill the idea that fundamental objects are 3-D was to say that superconformal invariance of super-string models is lost and the theory is not calculable. It took ineeed long time to realize that super-conformal has huge generalization when space-time is 4-D and imbedding space has Minkowski space as its factor. Twistorial considerations fixed the whole scheme uniquely. Theoretician should be patient.

2.3 TGD inspired theory of consciousness

The believer in quantum consciousness of course wonders what could be the quantum counterparts of deconstruction and reconstruction. It would seem that analysis and synthesis of the sensory input deconstructs the mental image associated with it to features - simpler fundamental mental images- and reconstruct from these the percept as mental image. What does this correspond at the level of physics?

Before one can really answer one must understand what the quantum physical correlates of mental image are. How mental images die and are born? What features are as mental images? What their binding to sensory percepts does mean physically?

Here I can answer only on my own behalf and to do it I must introduce the basic notions and ideas of TGD inspired theory of consciousness. I will not go to details here because I have done this

so many times and just suggest that the reading of some basic stuff about TGD inspired theory of consciousness. Suffice it to list just the basic ideas and notions.

1. Zero energy ontology and causal diamonds and hierarchy of Planck constants assignable to quantum criticality are basic notions. Number theoretic vision is also central. In particular, adelic physics fusing real physics and various p-adic physics as correlates for cognition is also basic building brick.

2. Consciousness theory is generalization of quantum measurement theory constructed to solve the basic problems of ordinary quantum measurement theory: observer becomes self described by physics rather than being outsider of the physical world. Negentropy Maximization Principle (NMP) defines the basic variational principle and state that the negentropy gain in state function reduction is maximal.

   Self hierarchy is the basic notion of TGD inspired theory of consciousness. Self experiences subselves as mental images. Self corresponds to a state function reduction sequence to the same boundary of causal diamond (CD). In standard quantum measurement theory this sequence does not change the state but in TGD framework the state at the opposite boundary of CD and even opposite boundary changes. This gives rise to the experience flow of time having the increases of the temporal distance between the tips of CD as a geometric correlate. Self dies as the first reduction to the opposite boundary takes place and re-incarnates at the opposite boundary as its time reversal. Negentropy Maximization Principle forces it to occur sooner or later. The continual birth and death of mental images supports this view if one accepts the idea about hierarchy. One can also consider identification for what the change of the arrow of time means for mental image.

3. Magnetic bodies carrying dark matter identified as $h_{eff} = n \times h$ phases of ordinary matter define quantum correlates for selves. Magnetic body has hierarchical onion-like structure and it communicates with biological body using dark photons propagating along magnetic flux tubes. EEG and its fractal generalization make both communication from/control of biological body to/by magnetic body. Dark matter hierarchy can be reduced to quantum criticality and this in turn has deep roots in the adelic physics.

What reconstruction could mean in TGD inspired theory of consciousness?

1. The restriction of deconstruction to the degrees of freedom of elementary particle is unnecessary restrictive. One can consider also larger units such a as molecules, cells, etc.. and their representations using tensor products.

2. Besides bound state formation also negentropic entanglement (NE) allows reconstruction of states which are almost stable with respect to NMP. There are two kinds of NE. which can be metastable with respect to NMP. In the first case density matrix is a projector with n identical eigenvalues. This state can result in a state function reduction since it is an eigenstate of the fundamental observable defined by density matrix. It can also happen that the eigenvalues of density matrix having matrix elements in algebraic extension algebraic extension of rationals characterizing the system in the evolutionary hierarchy do not belong to the extension. One can argue that since diagonalization is not possible in the extension, also state function reduction is impossible without a phase transition extending the extension and identifiable as a kind of evolutionary step.

   Both kinds of NEs might be involved. The first option would correspond to a kind of enlightened consciousness since any orthonormal state basis would define eigenstate basis of density matrix. Schrödinger cat would be half alive and half dead or half of X and half of Y, where X and Y are any orthonormal superpositions of alive and dead. For the second option there would be a unique state basis. For instance, cat could be $1/\sqrt{2}$ alive and $1 - 1/\sqrt{2}$ dead. This could correspond to a state of rational mind discriminating between things. If a phase transition bringing in $\sqrt{2}$ takes place, state function reduction makes cat fully alive or dead.

3. In condensed matter example the velocity of quantal wave motion serves as a criterion allowing to tell whether the degrees of freedom bind or not. Electron velocity is obviously too

limited as a signature for binding or its absence. In neuroscience the coherence of EEG is seen as a signature of binding and this suggests that oscillation with same EEG frequency is the signature of binding of mental images to a larger one. In TGD inspired theory of consciousness EEG frequencies correspond to differences of generalized Josephson frequencies that is sums of Josephson frequency for the resting potential and of the difference of cyclotron frequencies for ions at different sides of cell membrane [**?**, **?**, **?**].

4. At the level of magnetic flux tubes binding would correspond to a reconnection of magnetic flux tubes of synchronously firing region to form a larger structure for which the magnetic field strength is same for the composites and therefore also cyclotron frequencies are identical. Reconstruction would have a concrete geometric correlate at the level of magnetic flux tubes as reconnection. Different parts of brain containing quantum states serving as features of mental image would connected by flux tubes of the magnetic body and binding of mental images would take place.

5. In TGD inspired quantum biology dark matter identified as large $h_{eff} = n \times h$ phases give rise to a deconstruction if one accepts the hypothesis $\hbar_{eff} = \hbar_{gr} = GMm/v_0$, where M represents mass of dark matter and m particle mass. Here h_{gr} is assigned with a flux tube connecting masses M and m and v_0 is a velocity parameter characterizing the system. This hypothesis implies that dark cyclotron energy is proportional to $h_{gr}f_c$, where f_c is cyclotron frequency is independent of particle mass: universal cyclotron energy spectrum is the outcome. The dark cyclotron photons can transform to ordinary photons identified as bio-photons.

   What makes this so remarkable is that particles with magnetic dipole moment possessing different masses correspond to different values of h_{eff} and reside at different magnetic flux tubes. This is mass spectroscopy - or deconstruction of charged particles matter by taking the particles with different masses to their own dark worlds! Dark living matter would not be a random soup of particles: each charged particle (also neutral particles with magnetic dipole moment) sits neatly at its own shelf labelled by h_{gr}! In TGD inspired theory of consciousness magnetic flux tubes can be associated with magnetic bodies serving as correlates of selves so that deconstruction for mental images would reduce to this process with each charged particle representing one particular combination and perhaps also a quale [**?**].

What about re-construction in this framework?

1. In reconstruction flux tube connections between two subsystems representing sub-selves (experienced by self as mental images) would be formed so that they would fuse to single system characterized by the same cyclotron frequency. Flux tube connection would be formed by the reconnection of U-shaped flux tubes to form single pair of connecting flux tubes connecting the systems. Resonant exchange of dark cyclotron photons and also dark super-conductivity would accompany this process. This process would represent a correlate for directed attention and would take place already at bio-molecular level. For instance, I have proposed that biomolecules with aromatic rings in which circulating electron pair currents generate magnetic bodies are especially important and in some sense fundamental level of the self hierarchy at molecular level. In brain different brain regions could connect to single coherently firing region in this manner.

2. The magnetic bodies associated with brain regions representing features could be connected in this manner to larger sub-selves. Negentropic quantum entanglement - a purely TGD based notion - could define a further correlate for the binding. This entanglement could take place in discrete degrees of freedom related to the hierarchy $h_{eff} = n \times h$ of Planck constants having no correlate in standard physics. The discrete degree of freedom would correspond to n sheets of singular coverings representing space-time surfaces. The sheets would co-incide at the ends of causal diamonds (CDs): on possible interpretation (holography allows many of them) could be that entire closed 3-surfaces formed by space-like 3-surfaces and light-like 3-surface connecting them can be seen as basic objects.

3. Reconstruction by negentropic quantum entanglement and flux tube connections inducing resonance could also lead to non-standard composites. Synesthesia could be understood

in this manner and even the sensory experience about circle with four corners could be understood. The binding of left and right brain visual experiences to single one could take place through negentropic entanglement and effectively generate the third dimension. The dimensions would not however simply add: 3-D experience instead of 4-D. Could sensory perception of higher than 3-D objects be possible by a reconstruction fusing several visual percepts - maybe even from different brains - together? Could higher levels of self hierarchy carry out this kind of reconstruction? Could Mother Gaia fuse our experiences to single experience about what it is to be a human kind, species, or bio-sphere?

3 Could condensed matter physics and consciousness theory have something to share?

Magnetic bodies are present in all scales and one can to ask whether consciousness theory condensed matter physics might have something in common. Could the proposed description apply even at the level of condensed matter? Could construction and reconstruction of mental images identifiable as sub-selves take place already at this level and have interpretation in terms of primitive information processing building standardized primitive mental images?

Deconstruction need not be restricted to electron and velocity could be replaced by oscillation frequency for various fields: at quantum level there is not actually real distinction since in quantum theory velocity defines wave vector. Also more complex objects, atoms, molecules, etc. could be deconstructed and the process could occur at the level of magnetic bodies and involve in essential manner reconnection and other "motor actions" of flux tubes. The notions of quasi-particle and collective excitation would generalized dramatically and the general vision about basic mechanism might help to understand this zoo of exotics.

Future condensed matter theorists might also consider the possibility of reconstruction in new manner giving rise to the analogs of synesthesia. Could features from different objects be recombined to form exotic quasi-objects having parts all around. Could dark matter in TGD sense be involved in essential manner: could cyclotron resonance or its absence serve as a correlate for the binding. The disjoint regions of space would be in well-defined sense near to each other in the reconstructed state. Topology would be different: p-adic topology could provide a natural description for a situation: in p-adic topology systems at infinite distance in real sense can be infinitesimally close to each other p-adically.

One can build many-particle states free many-particle states using tensor products of these primitive tensor factors. Bound states are clearly new kinds of particle like entities. Under additional constraints one obtains bound states. Could deconstruction in physical sense mean the decomposition of this kind of bound states to effectively free many-particle states? Can one see reconstruction the reversal of these process? And is it possible that tensor factors are combined in a totally new manner somewhat like basic geometric features in deconstructivistic architecture?