Is it possible to reverse Alzheimer's disease?

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Abstract

Dale Bredesen has written a marvellous book titled "The End of Alzheimer's". In this article I translate the discoveries of Bredesen's group about Alzheimer's disease (AD) to the language of TGD. The key idea is that AD and many other diseases could be seen as disorders related to the communications from biological body (BB) to the magnetic body (MB) carrying matter as $h_{eff}/h = n$ phases of ordinary matter. BB serves in very general sense as a sensory receptor and motor organ.

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1 Introduction

Dale Bredesen has written a marvellous book titled "*The End of Alzheimer's*" [J1] (see http://tinyurl.com/ya8nkan9) - thanks for my friend Pertti for an excellent Christmas gift.

Alzheimer's disease (just AD in the sequel) has been regarded as a disease without any effective treatment. A lot of progress has however occurred during last years in the understanding of AD and related diseases causing neuro-degeneration. Bredesen's group has developed a programme to stop and even reverse the development of cognitive decline and dementia.

1.1 Programme for reversing AD

The first chapter of the book contains a long list about the symptoms of AD. One must be cautious while reading this list. A strongly introvert and unpractical person like me having suffered from strong social fears during childhood, youth and mid age might conclude having been AD patient for all his life. Our personality however means that we have our strengths and weaknesses. Only if we begin to lose our strengths, there is a good reason to get worried.

AD involves brain inflammation causing a generation of amyloid, a plaque that destroys synaptic connections crucial for various learned skills. This leads to the symptoms of AD. Amyloids were for long time thought to be the cause of AD but it turned out to be only a manner how brain

defends itself: in AD this defence has only developed to over reaction: somewhat like too strong immune response causing allergy.

In an attempt to to cure AD one can do three things (in collaboration with a professional since AD has strongly patient dependent profile).

1. Get rid of the brain inflammation.
2. Eliminate the sources of inflammation: both infection by microbes and sugar containing proteins.
3. Provide brain with the needed nutrients including metabolic energy, hormones, and trophic factors helping the regeneration of synapses.

This program requires nothing less than changing of the life style.

1.2 AD as suicidal behavior at neuronal level

The motivation for this post emerged as I started to read a chapter about how the new view about AD developed through the study of AD in Petri dishes, a completely new lab level approach initiated by Bredesen's group. Two big surprises were in store.

1. It was found that in AD the neurons perform a suicide instead of fighting against the disease! They just give up! This was something totally unexpected.
2. The researchers had an idea that there are receptors in brain stem, which could relate to neuro-degeneration. The idea was that when the receptors bind to corresponding ligands, the neuron dies. It would be kind of organized suicide. But this did not occur! Neurons die if the ligand is not present! A healthy neuron must have both the ligands and receptors. These ligands can be christened as neurotrophins since they support the growth of cell.

2 Translating the findings about AD to the language of TGD

It is fascinating to translate the findings of Bredesen's group to the language of TGD. This might even provide new insights to what is involved.

2.1 Some basic notions of TGD inspired biology

While reading, I realized that this fits nicely with the TGD based vision that magnetic body (MB) of the organism (biological body (BB)) or part of it takes care of BB, such as brain by receiving information as signals from brain and sending back control commands. Before continuing it is good to briefly summarize some key aspects of TGD view about biology and brain. There are several new notions.

1. The notion of MB distinguishes between TGD and Maxwellian (gauge theory) view about fields. In many-sheeted space-time one can say that physical object has field identity, field body. Given for instance a magnetic flux tube realized as topological field quantum -tubular 3-surface - one can tell, which physical system it emanates from. The double formed by organism and its environment is replaced with a triple formed by MB , BB , and environment, and this changes profoundly the view about possible disorders of organism.
2. Hierarchy of Planck constants $h_{eff}/h = n$ making possible macroscopic quantum coherence in various scales is a key element of TGD inspired quantum biology. This hierarchy emerges as a prediction of adelic physics suggested to provide a unification of ordinary physics and of physics of cognition by introducing besides real number based physics also various p-adic physics serving as a correlate of cognition. $h_{eff}/h = n$ hierarchy and p-adic length scale hypothesis define fractal hierarchies of length and time scales: this fractality means that the standard length scale reductionism breaks down and that interesting new effects emerge in all

scales. I have been identifying these effects for more than two decades now: the information flux from web has been indispensable in this task. Living matter would be one of the most striking deviations from the naive reductionism. Even molecular physics and chemistry fail to reduce to atomic physics as the reductionistic dogma dictates.

MB carries dark cyclotron condensates and dark photons with with non-standard value of $h_{eff}/h = n$. Cyclotron condensates and cyclotron radiation are crucial for the control of organism by its MB. The feed of metabolic energy generates cyclotron condensates.

3. The view about sensory perception and function of nerve pulse transmission differs from the standard view. Nerve pulse transition would not be communication between parts of CNS but building of communication line for dark photons making possible communications with maximal signal velocity [L3] [K2].

   (a) This would allow generation of sensory mental images at sensory organs by an iteration involving virtual sensory input from brain to sensory organs. Pattern recognition would be realized as a build-up of an artwork representing standardized mental image as near as possible to the original sensory input.

   (b) Neurotransmitters and all information molecules would be bridges needed to construct connected communication lines. Learning as formation of permanent synaptic connections would be generation of permanent bridges of this kind.

4. Cell membrane and perhaps also other structures serve as generalized Josephson junctions [K1]. The (generalized) Josephson radiation generated by nerve pulses would give rise to EEG (and perhaps also to its fractal counterparts) as communication of neural information from brain to MB via Josephson frequency modulation. The size scale of the layer of MB wold be rather large, of the order $1/f_c$, of the order Earth size in alpha band ($f_c \simeq 10$ Hz).

2.2 Disorders as problems in the communications between BB and MB and as problems at BB and MB

Both the failure of the communication and control links between magnetic body and problems at BB or MB can give rise to disorders/diseases. Many things can go wrong.

1. Magnetic flux tubes serve as kind of wave guides carrying signals consisting of dark photons. Telephone network gives an idea about the situation. The flux tube network would consists of permanently existing pieces, which can be connected to single connected communication line by attaching small bridges (relays) between disjoint flux tubes. This process is nothing attachment of information molecule (say neurotrophin ligand) to the receptor and thus serving as a bridge.

   If the connecting ligands are absent, the communication line does not exist and MB does not receive information from brain: MB cannot see its protege. Also the control of MB can fail if it involves this kind of bridges: MB becomes lame unable to help its protege.

   This is of course not the only mechanism. There might be ligands, which are competing for binding but not serving as relays so that the connection would not be built. This turns out to be the case in AP. The dynamical equilibrium between genuine bridges (trophins) and fake bridges (antitrophins) determines how much communication between MB and brain takes place. When fake bridges dominate, one has fully developed AP. This picture seems to be very general and apply also to a wide variety of other diseases, in particular Mad Cow disease.

   Could the blindness of MB with respect BB be the cause of A?! Could AD -and presumably many other diseases - be disorders in communications between BB and MB due to the broken communication lines? Does MB of brain as God of neurons purposefully reject some neurons? Sounds cruel but the limited metabolic resources could force to select between organism and individual neurons.

2. If MB is dynamical, some layers in its onion-like structure could even disappear. At the level of brain the structures of MB are indeed dynamical. The formation of mental image would involve the generation of connected quantum coherent flux tube network by the formation of bridges.

   Nerve pulse patterns would give rise to this kind of structure with neurotransmitters giving rise to small bridges between pre- and post-synaptic neurons. The formation of amyloid plaques would destroy the synaptic connections and destroy the MBs is the scale of brain.

   Remark: Watch-up network would serve as an analogy here.

3. The dark photons mediating the signal might fail to be generated at brain or at MB. Also depression involves brain inflammation. Depressive mood rather literally is characterized by a feeling of being rejected by God. MB has indeed forced to reject the patient if the signals from brain or to brain cannot propagate for some reason.

   Cyclotron radiation by biologically important ions would be needed to generate the dark photons needed in communications to and control from MB. EEG would be basic example of this kind of communications, which are however expected to be present in several frequency scales. Control commands could come via genome along flux sheets traversing DNA strand.

   Generalized Josephson radiation from neuronal membranes could mediate "sensory" information from brain to MB. The frequencies of generalized Josephson radiation are sums of differences $f_{0,in} - f_c out$ of cyclotron frequencies at the two sides of the neuronal membrane and genuine Josephson contribution $\Delta f = ZeV/h_{eff}$ coding for the nerve pulse patterns representing information as frequency modulation.

   At least the lack of Li and Mg are known to induce depression and suicide rates correlate with Li depletion. The cyclotron frequencies of Li_6 resp. Li_7 ions in the endogenous magnetic field $B_{end} = .2$ explaining the findings of Blackmann are 50 Hz (radiation at this frequency has biological effects) resp. 42 Hz (near thalamocortical resonance frequency) suggests that communications to MB suffer from Li depletion. Mg has cyclotron frequency 25 Hz (flash of light induces a response in dog's EEG at 25 Hz frequency).

4. Also control can fail. It is also possible that cyclotron condensates at MB are not generated so that MB cannot generate the dark cyclotron radiation driving the oscillators at biological body representing the control commands. This could be due to the lack of metabolic energy feed from BB to MB.

2.3 What AD actually is?

A further reading of the book taught more about what AD actually is.

1. It was found that peptide amyloid-beta (Aβ) is toxic to neurons acting as anti-trophin competing with trophin making possible the well-fare of neuron. The interpretation is in terms of competition between real and fake bridges. Since metabolic resources are finite, antitrophin can have healthy effect in many situations.

2. Amyloids was originally seen as the cause of AD. There exists so called dependence receptor known as amyloid precursor protein (APP): one might say that it monitors the state of neuron. There exists molecular scissors (proteases), which can split APP to either 2 peptides or 4 peptides.

   The members of peptide pair are inside and outside the cell membrane. They maintain the wellfare of the neuron. The 4 peptides divide two groups of 2 peptides inside outside of the membrane and include Aβ. Too high concentration of amyloid beta destroys synapses and leads to neuron death.

   Dynamical equilibrium between these two kinds of peptides determines the fate of the neuron. If the equilibrium shifts to the side of 4 bad peptides increasing their concentration, there is a risk that AD develops.

3. What determines the equilibrium between these two kinds of peptides? APP is a receptor than can bind to kinds of ligands, let us call them good and bad. The good ligand is known as netrin-1. In this case APP splits into to peptides supporting neuronal well-fare. Netrin-1 is trophin.

   Remark: Netrin comes from word "netr", which is sanskrit and means "one who guides". Netrin would indeed serve as a link to MB, which indeed guides!

   The bad ligand is Aβ! This leads to positive feedback. The higher the concentration of Aβ produced in splittings to 4 peptides is the faster the rate for the new similar splittings. This causes a catastrophe: an uncontrolled exponential growth of Aβ concentration analogous to cancer. Similar mechanisms appear also in cancer and Mad Cow disease. Peptides able to amplify their own concentration are known as prionic.

4. There are many causes of AP explaining why the usual single cause - single medication approaches to AD have failed. Bredesen's group as identified 36 independent causes of AD! One of these causes is APOE4. It was originally thought to reduce the clearance of amyloid from brain. This is true but it was also found to have much deeper role. It can affect gene expressing by binding to the promoter regions of DNA and preventing the transcription of genes coding for proteins promoting the well-fare of neuron. APOE4 is thus an active tool for inducing death of neuron.

5. Bredesen takes business organization in market economy as a metaphor. Brain must monitor whether the neurons are useful and whether metabolic and other resources are enough for survival. At older age these resources deplete. Brain must destroy the neutrons when there is shortage about nutrients, vitamins, hormones. Also neurons, which are inactive or somehow damage, must go.

2.4 TGD view about AD

The interpretation of this picture in TGD framework should be now rather obvious.

1. The simplest view is that netrin serves as a genuine bridge to MB and Aβ as the fake bridge. The dominance of fake bridges means that connection to MB is lost.

2. Brain must survive and decides to kill the neurons or force them to perform suicide, and uses APOE4 as one particular tool to realize this. MB would be innocent, so to say.

3. Or could MB serve as Stalin actively promoting neuronal death by activating mechanisms leading to neuronal death? Could the connections via the flux sheets of MB of DNA making possible control of BB allow this: is the activation of APOE4 preventing transcription of important genes related to this. One could argue that MB affects only DNA via promoter regions and APOE4 generated by brain itself prevents this. MB would not be Stalin after all.

4. Irrespective of who did it, in TGD Universe there is a hierarchy of selves and layers of MB serving as "Gods" and it includes also us. We can change our life style and prevent Alzheimer and many other diseases if we act early enough. We can do good deeds - also to our our biological bodies! Perhaps this is easier!

   Remark: This inspires the question whether same applies in capitalism/market economy, which is a fractal copy of biology at cell level in TGD Universe. We can transform biology to culture by bringing in ethics, values and moral.

2.5 Why Alzheimer does not destroy some aspects of consciousness?

Some aspects of consciousness seem to survive Alzheimer. Alzheimer patient can understand singing and also express himself by singing (see `http://tinyurl.com/y73zzrq4`). Why?

1. Singing is conventionally associated with holistic aspects of consciousness whereas language corresponds to reductionistic, local, and linear representation of conscious experience. Holistic-reductionistic dichotomy is often associated with right-left dichotomy. One should be of course cautious with this identification and be happy with holistic-reductionistic dichotomy.

2. In any case, we know that left brain talks and right brain sings. Singing is a representation in terms of frequencies. It is 2-dimensional because also the pitch matters unlike in the case of speech. Everyone familiar with Fourier transform knows that frequency representation is holistic: Fourier amplitude carries information about the function in the entire domain of definition but not about details for low enough frequencies such as occur in singing (maybe the duration of duration of nerve pulse of order millisecond could serve as standard, could notes with pitch below kHz frequency be low frequencies?).

3. Why cognition does not survive in Alzheimer is easy to understand. Cognition is by definition about details: left brain is responsible for language and language indeed local , *linear*(!), and reductionistic. Maybe 1-D neural strings and loops assignable to magnetic loops provide a realization of spoken and written language? Alzheimer would destroy synaptic connections and would split these strings. The disappearence of even single bridge in the loop/string splits the loop/string (into two): this is just 1-D topology. Communication line would be broken. Cognitive skills and language would be lost.

4. Why would the holistic aspects of consciousness survive in Alzheimer? Suppose that right brain involves 2-D net-work like structures instead of 1-D neural strings having much more connections and giving rise to quantum tensor network [L1] (see `http://tinyurl.com/y9kwnqfa`) as it would be fashionable to say. Quantum entanglement is very probably involved and would be actually responsible for the holistic and hologram-like aspects of neural activities known for a long time. It would not be surprising if brain waves with frequency spectrum below kHz would be important for this representation. EEG waves are almost by definition in the range 1-100 Hz.

   What happens to 2-D networks in the destruction of synapes. Practically nothing! Quite a number of synaptic connections can disappear but this does not split the 2-D network into pieces as it splits 1-D string: 2-D topology! Communications take place and the structure can take care of itself. Holograms are not affected by the local splitting of the synaptic connections. The right brain would happily continue its singing!

   Note that 2-D networks are also natural for the representation of sensory data as images and the language of images is different from the language of words: I have discussed the differences between these two different languages in [L2] (see `http://tinyurl.com/yb99u6u8`).

   The natural question is whether could one approach to Alzheimer rely on activation of right brain: could art therapies such as music and visual arts help in Alzheimer?

2.6 Questions about memory

AD also inspires questions about memory. Neuroscientists often identify memories as skills. There are however memories such as sensory memories, which can be induced in any-one by electrical stimulation of temporal lobes. Also dreams involve these memories. One can have spontaneous memory of some smell or suffer pain in non-existing leg. Some people often regarded as cognitively impaired might have sensory memories regularly: this could explain their amazing memory feats. Some people hear music all the time in their head: Tchaikovsky is one example of this.

I find it difficult to believe that sensory memories would reduce to strengthening of synaptic connections in the brain now: they are not learned skills. In TGD picture the new view about time leads forced by zero energy ontology (ZEO) leads to the idea that the perceptive field is 4-D causal diamond (CD, 2-D visualization helps to understand) and that sensory memories are mental images (sub-CDs) located near either boundary of CD. The remaining mental images inside CD would be represented symbolically so that it would make sense to speak about "sensory now" in 3-D sense. Cognitive impairment would mean a loss of the symbolic representations and sensory representations might replace it and make memory feats possible.

Remark: In ZEO one can even make the scifi sounding question whether the brains of geometric past still in good shape could be used? There are people who have lost most of their brains but still can cope with challenges of everyday life.

Could this view be tested? Could Alzheimer patients have long term memories about time when brain was still healthy? Could they have sensory memories about that time? This might be

the case: my grandmother lost her cognitive skills during her last years but re-lived her youth very intensely: she had even strong intention of going to dance!

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