

Hypnosis as Remote Mental Interaction

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Abstract

In TGD framework one can argue that hypnosis represents an example about the fact that brain is not "private property": hypnotist uses the biological body and brain of the subject as instrument. Therefore remote mental interaction is in question. This idea generalizes: if one accepts self hierarchy, one can assign to any kind of higher level structure - family, organization, species, - a higher level self and magnetic body carrying dark matter, and these magnetic bodies can use lower level magnetic bodies as their instruments to realize their intentions. Biological bodies would be an important level in the hierarchy, which would continue down to cellular, molecular, and perhaps to even lower levels.

This view challenges the prevailing views about brain as a sole seat of consciousness and the assumption that conscious entities assigned with brains are completely isolated. Given magnetic body can use several biological bodies although one can assign to it the one providing the sensory input - at least during wake-up state. Note however that it is easy to produce illusion that some foreign object is part of biological body.

For more than decade ago I proposed a model for so called bicamerality based on the notion of semitrance. In semitrance the brain of subject becomes partially entangled with a higher level self - in this case the self of family or more general social group uses the biological body of member for its purposes. Higher level self gives its commands and advice interpreted by the bicameral as "God's voice". The consciousness of schizophrenic might be basically bicameral. Also hypnotic state and dream consciousness are candidates for bicameral consciousness.

In this article I develop essentially this idea but using as input the recent understanding of about TGD inspired theory of consciousness and quantum biology and end up with a proposal for a detailed mechanism for how the magnetic body hijacks some parts of the brain of the subject: prefrontal cortex and anterior cingulate cortex are argued to be the most plausible targets of hijacking. Also a mechanism explaining how the sensory hallucinations and motor actions are induced by hypnotist by inhibiting a halting mechanism preventing imagined motor actions to become real and sensory imagination to become "qualified".

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1 Introduction

In TGD framework one can argue that hypnosis represents an example about the fact that brain is not "private property": hypnotist uses the biological body and brain of the subject as instrument. Therefore remote mental interaction is in question. This idea generalizes: if one accepts self hierarchy, one can assign to any kind of higher level structure - family, organization, species, - a higher level self and magnetic body carrying dark matter, and these magnetic bodies can use lower level magnetic bodies as their instruments to realize their intentions. Biological bodies would be an important level in the hierarchy, which would continue down to cellular, molecular, and perhaps to even lower levels.

This view challenges the prevailing views about brain as a sole seat of consciousness and the assumption that conscious entities assigned with brains are completely isolated. Given magnetic body can use several biological bodies although one can assign to it the one providing the sensory input - at least during wake-up state. Note however that it is easy to produce illusion that some foreign object is part of biological body.

For more than decade ago I proposed a model for so called bicamerality based on the notion of semitrance [K2, K3]. In semitrance the brain of subject becomes partially entangled with a higher level self - in this case the self of family or more general social group uses the biological body of member for its purposes. Higher level self gives its commands and advice interpreted by the bicameral as "God's voice". The consciousness of schizophrenic might be basically bicameral. Also hypnotic state and dream consciousness are candidates for bicameral consciousness.

1.1 Hypnosis as hijacking of brain?

In TGD framework hypnotist and subject would partially share the biological body of the subject, and hypnotist could realize motor actions using the biological body of the subject and also induce sensory experiences by sending suggestions generating virtual sensory input to the sense organs of the subject (this if one accepts TGD view about the role of sensory organs).

One could see hypnosis as a kind of hijacking of some parts of the subject's brain. Could one identify these parts? The general finding is that there is no universal neural or EEG signature of hypnotic state and possible changes in neural activity can be interpreted as neural correlates of imagination. Only in the case of persons highly susceptible to hypnotic induction one can identify a change of neural activity pattern identifiable as a correlate of hypnotic state.

"Hijacking" can be of course criticized for its negative tone. A more positive manner to express the idea is to say that the subject is voluntarily provides part of her brain to the use of the hypnotist's magnetic body. This conforms with the acronym "TEAM" symbolizing the subject's orientation to hypnosis in terms of "trust", "expectation", "attitude", and "motivation".

The neurophysiological findings conform with the view that the really interesting phenomena take at the level of magnetic bodies. The changes - when they occur - take place in prefrontal cortex (PFC) [J3] and anterior cingulate cortex (ACC) [J1]: this together what is known about methods of hypnotic induction provides hints about what might occur in the hijacking process. The almost-prediction would be a correlation between EEGs of the hypnotist and subject person reflecting the sharing of parts of the subject's brain. It would be therefore highly interesting to study the correlations of the EEGs of subject and hypnotist.

Strongly focused attention to hypnotic suggestion is mentioned as a basic aspect of hypnosis and distinguishes it sharply from sleep. This feature brings in mind various altered states of consciousness reached in meditation and it has been suggested that meditation is one form of self-hypnosis. In TGD framework personal magnetic body has layered onyon-like structure with layers characterized by p-adic length and time scales and the value of \hbar_{eff} . Therefore meditative state could be seen as a resharing of biological body and brain by these layers and even by foreign magnetic bodies.

1.2 Do social interactions share something with hypnosis?

More generally, one can also ask whether the phenomena of collaboration and synergy on one hand, and influence, "power" and fight for power on the other hand, could be modelled in terms of the partial ownership of the biological bodies by magnetic bodies identified as intentional agents.

Social structures and organizations are complex networks in which the arrows characterizing relationships between individuals in the simplest situations are uni-directional and static. The person at either end of the arrow is in command. In more complex situations members are connected by several arrows of this kind, their directions can vary, and need not be static.

Should one therefore give up what physicist would call "single-particle" view and replace it with "many-particle" view by bringing in the notion of magnetic body attaching to several biological bodies and organizing them to loosely bound states of individuals? Under what conditions this kind of partial fusion of conscious entities can take place? Does it occur only when there is complete trust in either direction or can fear about consequences be enough? It would not be surprising if immune systems against hijacking of the biological body would have evolved: this would allow to understand why the reality of remote mental interactions is so difficult to demonstrate. They could however take place on daily basis in social interactions if the proposed picture makes sense.

The dynamical sharing of biological bodies can be seen also positively: this sharing would make possible collaboration and synergy at much deeper level than we have been used to think. This kind of shared use of biological bodies perhaps defines the direction to which human kind should proceed. Also the possibility to directly experience what it is to be "the other one" - something not allowed by the standard view about consciousness confined inside individual brain - is implicated.

The new view about influence and power might allow to understand better the often highly irrational looking behaviors of organizations and their members - in particular blind obedience of orders and fight for power. The hierarchy of magnetic bodies could serve as a physical correlate for the hierarchy of biological and social structures. In particular, the fight for power could be seen as fight between magnetic bodies for the ownership of biological bodies or lower level magnetic bodies. The dark matter realized as a hierarchy of phases with non-standard value of effective Planck constant would represent a new physics necessary for understanding the physical correlates of these phenomena.

In the sequel I will introduce some basic notions, ideas and theories about hypnosis: the Wikipedia article [J2] gives a good overall view about the subject. The techniques of hypnotic induction provide valuable clues if one wants to imagine what hypnosis is. I will also describe the classical test for hypnotic susceptibility using Chevreul pendulum (to me it was quite a stunning experience to find that I am highly susceptible to hypnotic induction!), and propose an explanation in terms of hijacking of PFC and ACC by the magnetic body of hypnotist. The model makes an assumption about the logic of brain functions. Imagined motor action "Don't (really) do this" is realized as "Do this" followed by "Don't" stopping the imagined motor action proceeding otherwise from the magnetic body to PFC to motor regions of cortex via ACC to a real motor action.

In TGD framework sensory perception and motor action are related by time reversal and therefore an analogous mechanism applies to imagination realized as a genuine hallucination unless "Don't" is realized. Hypnotist should therefore hijack the brain regions realizing "Don't" by catching their attention so that they cannot perform their function. ACC is a good candidate for the region in which "Don't" is realized under normal circumstances. This logic makes possible to induce motor actions and sensory hallucinations analogous to dreams. Dreams would be realized in terms of virtual sensory input to sensory organs (REM) rather than only to higher levels in hierarchy of sensory representations at cortex, which do not carry visual qualia conscious-to-us.

2 Basic facts about hypnosis

The reader is recommended to read the Wikipedia article about hypnosis [J2] as a good introductory summary. The article begins by stating the basic big question about hypnosis: Can hypnosis be regarded either as a mental state (altered state of consciousness) or as an imaginative role-enactment? The first option conforms with the basic assumption of most existing theories of consciousness: consciousness is something completely private and in materialistic dogma reduces to the state of brain. Second option does not accept hypnosis as a genuine brain state and emphasizes the interaction between hypnotist and subject. Combined with standard neuroscience also this approach tries to understand hypnosis as single-brain phenomenon. In TGD view hypnosis is seen as a phenomenon involving two magnetic bodies interacting with single brain.

Also the heightened focus and concentration to a dominating idea (suggestion) blocking out sources of distraction is mentioned as characteristic of hypnosis and some theories emphasize this aspect instead of seeing hypnosis as a trance state.

The following discussion relies heavily on the Wikipedia article adding TGD inspired comments in the hope that they would help the reader to see the distinctions between TGD approach and more standard approaches.

2.1 Basic definitions

In the following basic definitions of hypnosis are considered. The discussion follows the Wikipedia article with TGD inspired comments.

2.1.1 Definition of hypnosis

Braid's original definition of hypnosis was following:

[...] the real origin and essence of the hypnotic condition, is the induction of a habit of abstraction or mental concentration, in which, as in reverie or spontaneous abstraction, the powers of the mind are so much engrossed with a single idea or train of thought, as, for the nonce, to render the individual unconscious of, or indifferently conscious to, all other ideas, impressions, or trains of thought. The hypnotic sleep, therefore, is the very antithesis or opposite mental and physical condition to that which precedes and accompanies common sleep [...]

Braid defined hypnotism as a state of mental concentration that often leads to a form of progressive relaxation, termed "nervous sleep". Later, in his "The Physiology of Fascination" (1855), Braid concluded that his original terminology was misleading, and argued that the term "hypnotism" ("hypnos" refers to sleep) or "nervous sleep" should be reserved for the minority (10 %) of subjects who exhibit amnesia, substituting the term "monoideism", meaning concentration upon a single idea, as a description for the more alert state experienced by the others.

The recent official definition of hypnosis is following:

Hypnosis typically involves an introduction to the procedure during which the subject is told that suggestions for imaginative experiences will be presented. The hypnotic induction is an extended initial suggestion for using one's imagination, and may contain further elaborations of the introduction. A hypnotic procedure is used to encourage and evaluate responses to suggestions. When using hypnosis, one person (the subject) is guided by another (the hypnotist) to respond to suggestions for changes in subjective experience, alterations in perception, sensation, emotion, thought or behavior. Persons can also learn self-hypnosis, which is the act of administering hypnotic procedures on one's own. If the subject responds to hypnotic suggestions, it is generally inferred that hypnosis has been induced. Many believe that hypnotic responses and experiences are characteristic of a hypnotic state. While some think that it is not necessary to use the word "hypnosis" as part of the hypnotic induction, others view it as essential.

2.1.2 Induction

Hypnosis is preceded by induction phase, which according to state theorists leads into a "hypnotic trance" whereas "non-state" theorists view induction as "means of heightening client expectation, defining their role, focusing attention".

There exists a large number of induction techniques. The oldest and still dominant one is the eye fixation technique used by Braid and focusing the visual attention to some object - say oscillating pendulum. Ericksonian hypnotherapy relies on indirect techniques to induce trance states. Almost all methods used by Erickson - say handshake induction - rely on confusion as a manner to induce hypnotic state. Erickson sees the resistance to direct suggestions as the basic challenge and used therefore indirect suggestions including so called double bind ("Shall we consider this problem now or perhaps later?") are used. Erickson saw hypnosis as a bi-directional process: also therapist can occasionally be in trance.

Remarks:

1. What notions like "role" and "client expectation" have as quantum physical correlates is of course unclear since even the notion of "consciousness" is poorly understood physically.
2. It has been proposed that all brain states are kind of hypnotic trance states: this extremist view brings in mind the view about magnetic body as a controller of brain and in this sense a hypnotist.
3. The unconscious-to-us fast visual pathway traverses through ACC, which suggests that the activation of ACC by visual attention to pendulum or some other object is involved in eye fixation technique. One can also ask whether flux tube connections retina - pendulum - retina are formed and whether the motion of pendulum promotes the their formation, perhaps in the same manner as "Mesmeric passes" might do.
4. ACC is the part of brain which seems to be involved with the treatment of conflicting situations and Francis Crick has identified it as a candidate for a locus of free will. This supports the view that ACC is indeed essential in the induction of hypnosis.

2.1.3 Suggestion

Braid did not refer to suggestion in his definition of hypnotic state but saw it as focusing of the attention of subject upon a single idea. Later Braid however placed emphasis on using different verbal and non-verbal suggestions.

Bernheim shifted the emphasis from hypnosis as a physical state to the physical process of suggestion:

I define hypnotism as the induction of a peculiar psychical [i.e., mental] condition which increases the susceptibility to suggestion. Often, it is true, the [hypnotic] sleep that may be induced facilitates suggestion, but it is not the necessary preliminary. It is suggestion that rules hypnotism.

Suggestion can take place permissively or in authoritarian manner. One can distinguish between direct and indirect verbal suggestions such as insinuations, requests, metaphors, and stories. There are also nonverbal suggestions and both immediate and posthypnotic suggestions are used in hypnotherapy. Also subliminal suggestions involving visual inputs lasting so short time that there is no conscious experience: at least in this case the unconscious-to-us fast visual pathway through ACC would be naturally involved.

1. *Consciousness vs. subconsciousness*

One of the basic issues related to hypnosis whether the suggestion is communication to the conscious or unconscious mind of the subject. Braid and Bernheim believed on conscious mind whereas Freud, Janet, and Erickson believe that sub-conscious mind is essential.

There is also the question whether a person in deep hypnosis is conscious. It seems that this is the case: for instance, person can report about sensory experiences during hypnosis if the hypnotist requests this. The focused attention with the reduction of peripheral awareness and increased response to suggestions seem to characterize the hypnosis.

Remark: In TGD framework subconscious and unconscious translate to "not conscious-to-us" and - according to the theory to be discussed - the highest level of subject's brain consciousness having FCC as brain correlate could fuse with that of hypnotist's magnetic body.

2. Ideo-dynamic reflex

The first theory of hypnotic state was introduced by Braid, and was based on ideomotor reflex response. The notion was originally introduced by William Carpenter, a friend of Braid. Carpenter observed that under certain circumstances the mere idea of muscular movement induce a small reflexive motor response.

Chevreur pendulum allows to demonstrate the ideo-motor reflex response in the case of highly susceptible subjects. The mere imagination of motor action producing the motion of the pendulum induces its motion and it seems that the imagination of motion generates the neural activity leading to the motion which due to the hypnotic induction is not stopped so that it can develop to a real motor action.

Remark: One could interpret ideo-motor reflex in TGD framework as imagined motor action identified as a genuine motor action which proceeds downwards from PFC but is stopped before reaching muscles. Sensory perception has an analogous interpretation as time reversal of motor action. During hypnosis this halting mechanism would be inhibited. This process would be one particular example of inhibition, which is basic mechanism of neural activity: in fact, the role of inhibition becomes more and more important during evolution.

2.1.4 Susceptibility

Hypnotic suggestibility [J2] measures how easily the person can be hypnotized.

Braid distinguished between different stages of hypnotism: sub-hypnotic state, full hypnotic state, and hypnotic coma. Charcot made similar classification using the attributes lethargic, somnambulistic, and cataleptic. Liebeault and Bernheim introduced a more refined classification based on a combination of behavioral, physiological and subjective responses. At 20th century more refined scales were introduced. The most common scales are the Harvard Group Scale of Hypnotic Susceptibility and the Stanford Hypnotic Susceptibility Scales.

Most scales measure nowadays the degree of observed or self-evaluated responsiveness to specific suggestion tests. Normal (80 % of population), high (10 % of population) , and low (10 % of population) is the simplest characterization of susceptibility. Highly susceptible subjects have been classified to fantasizers and dissociaters. Fantasizers have often had parents who have encouraged imagination. Dissociaters have typically a life history involving childhood abuse or some other trauma, and they have learned to escape into numbness and forget unpleasant events. The association to day-dreaming is "going blank" rather than fantasizing wildly.

2.2 A brief history of hypnosis and theories of hypnosis

Hypnosis has pre-cursors in yoga and meditation practices. Meditation could be seen as self-hypnosis (if hypnosis is "two-particle phenomenon", one can wonder what this might mean!). The intense focusing of attention on single mental image can be seen as a common aspect of hypnosis and meditation practices.

Franz Mesmer [?] was the pioneer of hypnosis. He used magnets to induce hypnotic state but later noticed that the same effects can be induced by passing the hands, at a distance from the subject's body ("Mesmeric passes"). Mesmer believed on what he called "animal magnetism" according to which Universe was filled with some kind of magnetic fluid. At the request of King Louis XVI a Board of Inquiry having as members Antoine Lavoisier, Benjamin Franklin and an expert in pain control,

Joseph-Ignace Guillotin (better known in somewhat different context), started to study whether animal magnetism is real. The effects were found to be real but placebo controlled experiments convinced the board that mesmerism was most likely due to belief and imagination rather than any sort of energy flowing from the hands of Mesmer.

Remark: In TGD approach to consciousness the flux quanta of magnetic bodies carrying dark matter become the key players of life and consciousness, and are also crucial for the understanding of hypnosis. Somewhat ironically, Mesmer might be making come-back. The effects would be mostly due to imagination but the hands of Mesmer might have induced magnetic flux tube connections making possible the hijacking of the brain of the subject!

James Braid [?] revisited both the theory and practise of Mesmerism trying to reduce mesmerism to physiology and psychology. Braid emphasized the differences between sleep and hypnosis. He did not believe in any kind of magnetism or supernatural occult influence.

Besides Mesmer and Braid, Bernheim, Janet, Freud, Coue, Hull, Elman, Erickson [?] are pioneers of hypnosis. Bernheim was a follower of Braid and emphasized suggestion as an essential element of hypnosis instead of viewing hypnosis as a trance state possessed by Braid.

Freud was highly enthusiastic about hypnosis and even wrote a book about hypnotherapy. After the advent of psychoanalysis he started to emphasize the role of free association as a road to unconscious mind. Freud however saw hypnosis as a fast alternative to time taking psycho-analytic therapy. As already described, Erickson developed his own hypno-therapy based on the use of confusion as a manner to achieve hypnotic induction. Erickson also realize that the hypnotic induction can work in both directions.

2.2.1 The notion of dissociation

Janet introduced the notion of dissociation of the control of behavior from ordinary consciousness [J2]. Hilgard introduced later the notion of neo-dissociation: the subject divides her mind voluntarily so that the other part responds to the hypnotist and the other part corresponds to the awareness of the subject. Hilgard made subjects take an ice water bath. They said nothing about the water being cold or feeling pain. Hilgard then asked the subjects to lift their index finger if they felt pain and 70 % of the subjects lifted their index finger. This showed that even though the subjects were listening to the suggestive hypnotist they still sensed the water's temperature.

Mind-dissociation theory of Tsai generalizes the notion of dissociation so that any function of mind can be dissociated. For instance, imagination can be dissociated leading to dreams, some sense can be dissociated leading to hypnotic anesthesia, motor function can be dissociated leading to immobility, "reason" (volition) can be dissociated so that the subject obeys the hypnotist's orders,...

2.2.2 Hypnotism as imagination becoming reality

A complementary view about hypnosis is as imagination, which becomes reality. Persons highly susceptible to hypnosis have been classified as either dissociators and fantasizers. Hence it seems that both views contain a germ of truth.

Remarks:

1. In TGD approach dissociation of the control of behavior from conscious mind has a concrete interpretation. The magnetic body of the hypnotist hijacks the prefrontal cortex responsible for the control of behavior. The division of the subject's mind claimed by the neo-dissociation theory conforms with this notion. Also braid regions responsible for other brain functions can be hijacked in this manner so that a picture analogous to that of Tsai emerges.
2. Also the role of imagination can be understood. Hypnotist can prevent the halting of the neural process behind motor imagination so that it transforms to genuine motor action. This hijacking and transformation of imagination to a real action applies also to sensory perception, which in TGD framework is time reversal for motor action and behavior and allows to understand sensory hallucinations induced by hypnotist.

2.2.3 Two key questions

In the following the history of hypnosis is discussed with emphasis on two questions.

1. Is hypnosis a genuine (altered) state of consciousness or is it a kind of role taking (partially unconscious) and learned social behavior possibly motivated by the need to appeal to the hypnotist?
2. Is hypnotic induction a message to conscious mind or subconscious/unconscious mind. Braid saw hypnotic suggestions as messages to the conscious mind whereas both Janet, Freud, and Erickson believed that hypnotic induction is communication with unconscious mind.

Remark: Self hierarchy implies that "unconscious" translates to "unconscious-to-us" in TGD framework. In TGD framework hypnotic induction would be a message to both conscious and unconscious-to-us levels of self hierarchy. The first guess would be that PFC serves as the neuro-anatomical correlate for conscious mind and ACC to that for unconscious mind. Fractality understood as abstraction hierarchy inspires the question whether PFC is same for cognition about cognition as ACC is for cognition.

2.2.4 State or no-state?

Braid saw hypnosis as a sequence of trance states whereas Bernheim did not believe hypnosis as state and saw suggestion as a key element of hypnosis and thus the interaction between hypnotist and subject. Erickson believed that trance states occur continually in everyday life (day-dreaming and situations in confusing situations) and that also hypnotist can fall in trance state.

Social role taking theory of Sarbin [J7] and cognitive-behavioral theory of Barber, Spanos, and Chaves [J5] took the latter view to extreme. According to social role taking theory hypnotic behaviour would be meaningful, goal-directed striving, its most general goal being to behave like a hypnotised person as this is continuously defined by the operator and understood by the client. Obviously this definition does not apply to self-hypnosis nor allows the interpretation of meditative states as self-hypnosis.

Pavlov could be seen a predecessor of cognitive-behavioral approach. Pavlov saw hypnosis as learned associations and conditioned inhibition. The argument was that the words used by hypnotist reach the whole cortex and can replace all signals reaching cortex and can therefore induce also behavioral reflexes.

The cognitive-behavioural theory of hypnosis is in some respects similar to Sarbin's social role-taking theory. In particular, Barber argued that responses to hypnotic suggestions were mediated by a "positive cognitive set" consisting of positive expectations, attitudes, and motivation. Daniel Araoz subsequently coined the acronym "TEAM" to symbolize the subject's orientation to hypnosis in terms of "trust", "expectation", "attitude", and "motivation".

Remarks:

1. No clear neuro-physiological correlates for a unique hypnotic state have been found except some signatures in the case of highly susceptible subjects. This does not support the interpretation of hypnosis as an altered state of consciousness if hypnosis is interpreted as "single-brain" phenomenon. In TGD framework hypnosis would involve the magnetic body of hypnotist and even altered states of consciousness achieved in meditation could be seen as analogs of hypnotic states (self-hypnosis). Hence the two views about hypnosis would be consistent in TGD framework.
2. Although the approach of Pavlov looks like exaggeration it might make sense in TGD framework if reflex action is seen as standardized mental image accompanied by a pattern of neural activity. If patterns of neural activity define representations of imagined motor actions and sensory percepts and if also speech reduces to this kind of patterns, one can imagine that the mechanism inhibiting the inhibition of imagination from proceeding to real motor action or sensory percept can produce motor actions and sensory percepts. The acronym TEAM could be interpreted as listing the prerequisites for the readiness of subject to allow hypnotist to use the brain of subject.

2.3 Neurophychology and hypnosis

One can find in Wikipedia article a short summary about neuropsychology of hypnosis.

Neurological imaging techniques provide no evidence for a neurological pattern that could be equated with a "hypnotic trance". Changes in brain activity have been found in some studies of highly responsive hypnotic subjects. These changes vary depending upon the type of suggestions being given. However, what these results indicate is unclear. They might indicate that suggestions genuinely produce changes in perception or experience that are not simply a result of imagination. However, in normal circumstances without hypnosis, the brain regions associated with motion detection are activated both when motion is seen and when motion is imagined, without any changes in the subjects' perception or experience. This may therefore indicate that highly suggestible hypnotic subjects are simply activating to a greater extent the areas of the brain used in imagination, without real perceptual changes. It is, however, premature to claim that hypnosis and meditation are mediated by similar brain systems and neural mechanisms.

According to Wikipedia article another study has demonstrated that a color hallucination suggestion given to subjects in hypnosis activated color-processing regions of the occipital cortex. A 2004 review of research examining the EEG laboratory work in this area concludes:

Hypnosis is not a unitary state and therefore should show different patterns of EEG activity depending upon the task being experienced. In our evaluation of the literature, enhanced theta is observed during hypnosis when there is task performance or concentrative hypnosis, but not when the highly hypnotizable individuals are passively relaxed, somewhat sleepy and/or more diffuse in their attention.

Hypnotic suggestion seems to enhance imagination: this conforms with the basic vision that hypnosis involves strong concentration on suggestion defining what is imagined.

The induction phase of hypnosis may also affect the activity in brain regions that control intention and process conflict. According to Anna Gosline:

Gruzelier and his colleagues studied brain activity using an fMRI while subjects completed a standard cognitive exercise, called the Stroop task. The team screened subjects before the study and chose 12 that were highly susceptible to hypnosis and 12 with low susceptibility. They all completed the task in the fMRI under normal conditions and then again under hypnosis. Throughout the study, both groups were consistent in their task results, achieving similar scores regardless of their mental state. During their first task session, before hypnosis, there were no significant differences in brain activity between the groups. But under hypnosis, Gruzelier found that the highly susceptible subjects showed significantly more brain activity in the anterior cingulate gyrus than the weakly susceptible subjects. This area of the brain has been shown to respond to errors and evaluate emotional outcomes. The highly susceptible group also showed much greater brain activity on the left side of the prefrontal cortex than the weakly susceptible group. This is an area involved with higher level cognitive processing and behaviour.

Stroop task involves two conflicting cues and one might expect that ACC is involved with the solution of this kind of task. The similar performance before hypnosis and during hypnosis suggests that the changes in activity did not improve the task performance but were somehow due to hypnotic induction.

Remark: Concerning TGD approach to hypnosis, the findings about PFC and ACC give important clues concerning the possible mechanism of hypnotic induction. The absence of specific neurological pattern reflecting "hypnotic trance" conforms with the idea that hypnosis involves something more than just brain. Instead of presence of specific EEG patterns one can expect the synchrony of EEGs of hypnotist and subject.

3 TGD view about hypnosis

In the following TGD inspired ideas about hypnosis are discussed. The basic guideline is the observation that PFC and ACC seems to be the brain regions activated in Stroop task under hypnosis in the case of highly susceptible subjects. A more detailed view about functions of these brain areas suggests a picture about hypnosis as a kind of hijacking of the subject's PFC and ACC by the magnetic body of the hypnotist so that the biological body and brain of the subject become to some extent part of the hypnotist. One could say that hypnosis represents one particular example of remote mental interactions in which remote control of personal biological body by magnetic body is extended to that of the foreign biological body.

Second key assumption is that imagined motor action is a halted motor action. This applies also to sensory imagination, which however involve a virtual sensory input from magnetic body to the primary sensory organs. In hypnosis hypnotist can prevent this halting action. A plausible candidate for the seat of the halting action is ACC which also is in some respects analogous to a lower level variant of PFC. This kind of analogy makes sense if brain is fractal like structure.

3.1 Chevreul pendulum as a manner to end up with the model of hypnosis

My personal interest on hypnosis as a possible application of TGD inspired theory of consciousness was re-stimulated by an experience testing my susceptibility to hypnotic induction. My own expectation was that I would not be "an easy case". The test was done by using improvised Chevreul pendulum. I held the pendulum at the height of my eyes. I received two kinds of suggestions. The first suggestion was a prediction that the pendulum will move. Second direct suggestion was "Don't move the pendulum". To my surprise the pendulum started to move and its amplitude grew gradually. I must admit that this looked like magic.

The first TGD inspired interpretation to come in mind was that the magnetic body of hypnotist hijacked some parts of my brain and used it to realize the suggestions given also verbally to increase their effectiveness. The discussion about the paradoxical outcome of "Don't move the pendulum" led to the key ideas of the model.

1. Imagined motor action is realized as halted motor action - the negation of motor action: somehow this halting action should fail for hypnotic suggestions. In other words, the imagined motor action starts at high level, most naturally PFC and then proceeds downwards until it is halted in normal circumstance. By the duality relating motor action and sensory perception by time reversal (predicted by zero energy ontology [K4]) similar mechanism should work at the level of sensory perception. Halting would involve inhibition of the neural signals otherwise propagating to muscles. The same failure of the halting mechanism would be behind dreams and hallucinations and automatisms as their motor counterparts.
2. Since ACC serves as a central station for top-down and bottom-up signals, ACC might be the place, where the halting signals are sent to various parts of motor cortex. Hence the catching of the attention of ACC so that it fails to perform its ordinary job would be the natural thing to do. This is achieved by generating flux tube connection binding ACC and some part of hypnotizers magnetic body to single quantum coherent system. ACC has also connections to PFC so that also PFC could be hijacked via ACC - at least in deep hypnosis.
3. ACC takes care of conflict situations and confusion as an effective method to induce hypnosis could be alternative to the eye fixation method. Confusion would induce distress inducing a contact with some magnetic body possibly providing help. This could be a basic mechanism in bicameral and schizophrenic consciousness in which "God's voice" provides commands and advices. In the case of hypnotic induction the magnetic body of hypnotist would come in rescue. The activity of ACC would be a signature of conflict situation and could help in generating the connection.
4. The formation of flux tube connections could make the pendulum effectively a part of the biological body of the subject. This is nothing new: almost anyone knows that we feel bicycle or car effectively as our body part. Also illusions in which subject person identifies an external object as part of the biological body are created routinely. The command "Don't move the

pendulum” would be realized as a *motor command* ”Move the pendulum” which would be usually halted but hypnotic induction would prevent this.

Some remarks about the relation to more general TGD based ideas about quantum biology and consciousness are in order.

1. The basic distinction between hijacking model and more standard models is that hypnosis is not single-brain phenomenon anymore. It would be interesting to see whether there is synchrony between the EEGs of hypnotists and subject in PFC and ACC and whether the synchronies between various brain regions could correlate with the nature of suggestions.
2. In this framework self-hypnosis would represent a situation in which some external magnetic body hijacks the brain of the person. This magnetic body could correspond to a layer of personal magnetic body or perhaps a magnetic body assignable to some collective level of consciousness as the model of bicameral and schizophrenic consciousness suggest.
3. Hypnosis can induce regression to childhood and is claimed to induce even memories about earlier lives. For instance, subjects manner to speak becomes childlike in this kind of state. Standard neuroscience does not allow beyond life memories but in TGD framework the situation remains open (for ”Akashic records” view about memories see [K4]). One can argue that a strong concentration to the suggestion might allow to become conscious about memories of childhood and even of previous lives.
4. Reconnection of flux tubes and phase transitions changing the effective value of Planck constant and therefore the length of flux tubes are basic mechanisms of TGD inspired quantum biology. Catching the attention of ACC would be as a mechanism very similar to its molecular counterpart in the TGD inspired model of homeopathic healing [K1]. In the latter case the attention of receptors at cell membrane is caught by an entity mimicking the invader molecule binding otherwise to the receptor. Hence most receptors bind to entities which do not cause the damaging effects produced by the invader molecules. Mimicry would be mimicry of cyclotron frequencies achieved by tuning the magnetic field strengths associated with the mimicking entity and at the same time making possible reconnection inducing flux tube connections and conscious attention at molecular level.

3.2 Hypnosis as hijacking of foreign biological body

In the following I use hijacking as a metaphor for what could happen in hypnotic induction. A more positive manner to see the process would be as a voluntary sharing of brain with hypnotist’s magnetic body. If one accepts TGD based view about remote mental interactions implying that personal magnetic body controls biological body by remote mental interactions, hypnosis represents a genuine example of remote mental interaction.

The model to be discussed assumes that hypnotist’s magnetic body hijacks some parts of the subject’s brain. The mind-dissociation model encourages to think that almost any brain region/function can be hijacked. One can however expect that there are some preferred brain regions: kind of central stations especially favorable and sensitive targets for high-jacking. In this respect important hints come from what are believed to be basic facts about functions of prefrontal cortex (PFC) [J3] and anterior cingulate cortex (ACC) [J1], and from the observation that for highly susceptible subjects these regions demonstrate heightened activity during hypnosis during the performance of so called Stroop test.

3.2.1 Prefrontal cortex as target of hijacking

The general ideas of the hijacking model were already described. The following provides a more detailed discussion of the model (anyone with better background in neuroscience could probably add interesting details). The best strategy is to hijack the highest brain regions responsible for volition and control of motor and sensory imagination. Prefrontal cortex (PFC) is certainly an excellent candidate in this respect but it is not of course clear whether the direct hijacking of PFC is easy.

Prefrontal cortex is the anterior part of frontal lobes lying in front of the motor and premotor areas. This brain region has been implicated in the planning complex cognitive behavior, personality

expression, decision making, and moderating social behavior. One can also say that PFC carries executive function. This means cognition relating to control of cognition meaning thoughts/descsions about thoughts - imagination. Executive function relates to abilities to differentiate among conflicting thoughts, determine good and bad, better and best, same and different, future consequences of current activities, working toward a defined goal, prediction of outcomes, expectation based on actions, and social "control" (the ability to suppress urges that, if not suppressed, could lead to socially unacceptable outcomes). Clearly, PFC, the size of which also distinguishes between us and other primates, represents a very high if not the highest level of cognitive hierarchy unless one includes also the hierarchy of layers of the magnetic body.

A damage to frontal lobes can lead to loss of some of the listed functions, in particular to inability to make decisions so that also the patient has not lost his intellectual abilities and skills, he cannot do anything spontaneously but outsider must make the initiatives: this state brings in mind hypnotic state.

3.2.2 Anterior cingulate cortex as second target of hijacking

ACC is second brain area of primary interest. According to Wikipedia:

ACC is the frontal part of the cingulate cortex, which resembles a "collar" surrounding the frontal part of the corpus callosum. It consists of Brodmann areas 24, 32, and 33. It appears to play a role in a wide variety of autonomic functions, such as regulating blood pressure and heart rate, as well as rational cognitive functions, such as reward anticipation, decision-making, empathy, impulse control, and emotion.

The anterior cingulate cortex can be divided anatomically based on cognitive (dorsal), and emotional (ventral) components. The dorsal part of the ACC is connected with the prefrontal cortex and parietal cortex as well as the motor system and the frontal eye fields making it a central station for processing top-down and bottom-up stimuli and assigning appropriate control to other areas in the brain. By contrast, the ventral part of the ACC is connected with amygdala, nucleus accumbens, hypothalamus, and anterior insula, and is involved in assessing the salience of emotion and motivational information. The ACC seems to be especially involved when effort is needed to carry out a task such as in early learning and problem-solving.

On a cellular level, the ACC is unique in its abundance of specialized neurons called spindle cells [J4]. These cells are a relatively recent occurrence in evolutionary terms (found only in humans and other great apes, cetaceans, and elephants) and contribute to this brain region's emphasis on addressing difficult problems, as well as the pathologies related to the ACC.

A typical task that activates the ACC involves induction of some form of conflict within the subject that can potentially result in an error. Stroop task represents one such task and activates the ACC of highly susceptible subjects more strongly during hypnosis. In Stroop task the person must name the color of the ink of words that are either congruent or in-congruent (the color of the word RED is red or blue). The conflict occurs since the color or the written word is in conflict with the meaning of the word. Erickson's methods use confusion as a means of inducing hypnosis. This suggests that the activation of ACC by confusion is essential for hypnotic induction.

Error detection, anticipation of tasks, attention, motivation, and modulation of emotional responses are functions assigned with the ACC. Deep focusing of attention is indeed essential for hypnosis. The fact that frontal eye fields representing unconscious-to-us fast visual pathway initiating of eye movements such as voluntary saccades, pursuit eye movements and its connection to ACC suggests that the pendulum catches the attention of ACC in the Chevreul test. The fact that prefrontal lobes are connected to ACC suggests that hijacking of PFC could take place via ACC.

Francis Crick identifies ACC as a possible locus free will. In TGD framework this kind of identification is too strong. One might however consider the possibility that ACC is the part of brain halting the motor imagination proceeding as cortical activity downwards and prevents it from transforming to a genuine motor action. Volition might be quite generally halting or non-halting of imagined motor action. By the time reversal symmetry relating motor action and sensory perception in TGD framework, ACC would play similar role for sensory perception. Note that the selection between sensory

percepts associated with bin-ocular rivalry could be understood in terms of time reversed volition. The role of ACC as central station for bottom-up and top-down stimuli would conform with this view.

Remarks:

1. One can imagine two kinds of stimuli: the motor stimuli initiated at frontal lobes originally as imagination and possibly halted by ACC and simple motor stimuli initiated by ACC respectively proceeding directly to motor organs via premotor cortex. In the similar manner one can image sensory stimuli received by ACC and not proceeding to upper levels and those proceeding to higher levels and sensory stimuli proceeding up to PFC.
2. This division could roughly correspond to "slow" and "fast" (unconscious-to-us) sensory and motor pathways. Freud's super-ego-ego-Id hierarchy might in turn relate to magnetic body-PFC-ACC division. The interpretation of ACC as a primitive analog of PFC would also conform with the role of ACC in early learning. Hijacking of ACC first by redirecting its attention - to say pendulum - so that it cannot take care of some of its basic functions, could be part of hypnotic induction.

Why the activation of ACC should promote the hypnotic induction? The activation could be a neural correlate for confusion, which puts the person to the same position in which bicameral according to Jaynes was and schizophrenic is often. In this kind of situation some higher layer of the personal magnetic body could come in rescue. The generation of reconnections requires that ACC performs "magnetic motor activity" modulating the thickness of the flux tubes of its magnetic body (tuning the value of magnetic field to be the same as that of the hoped for helper) and perhaps also moving the flux tubes to achieve the desired reconnection. In the case of hypnosis the reconnection of between the magnetic bodies of ACC and hypnotist would take place. If ACC is responsible for "Don't" function then catching the ACC's attention by hypnotic induction or confusing it would allow the imagined motor actions and sensory perceptions to become real and hypnotic suggestions could be realized.

3.3 Preconscious mechanism of hypnotically altered colors

I learned recently about very interesting work on hypnosis by finnish researchers Mika Koivisto, Svetlana Kirjanen, Antti Revonsuo and Sakari Kallio. The article "A Preconscious Neural Mechanism of Hypnotically Altered Colors: A Double Case Study" is published in journal Plos ONE [J6] and is available at <http://dx.plos.org/10.1371/journal.pone.0070900>.

Here is the abstract of the article:

Hypnotic suggestions may change the perceived color of objects. Given that chromatic stimulus information is processed rapidly and automatically by the visual system, how can hypnotic suggestions affect perceived colors in a seemingly immediate fashion? We studied the mechanisms of such color alterations by measuring electroencephalography in two highly suggestible participants as they perceived briefly presented visual shapes under posthypnotic color alternation suggestions such as all the squares are blue. One participant consistently reported seeing the suggested colors. Her reports correlated with enhanced evoked upper beta-band activity (22 Hz) 70120 ms after stimulus in response to the shapes mentioned in the suggestion. This effect was not observed in a control condition where the participants merely tried to simulate the effects of the suggestion on behavior. The second participant neither reported color alterations nor showed the evoked beta activity, although her subjective experience and event-related potentials were changed by the suggestions. The results indicate a preconscious mechanism that first compares early visual input with a memory representation of the suggestion and consequently triggers the color alteration process in response to the objects specified by the suggestion. Conscious color experience is not purely the result of bottom-up processing but it can be modulated, at least in some individuals, by top-down factors such as hypnotic suggestions.

According to the announcement of finnish academy, the results challenge the existing theories of hypnosis. This work represents a model of hypnosis as one particular instance of remote mental interactions on basis of TGD inspired quantum theory of consciousness. Quantum entanglement between parts of separate brains, the notion of magnetic body, and TGD based view about sensory

organs play key roles in the model. In TGD framework the primary qualia are at the level of sensory organs and sensory representations involve a feedback from magnetic body via brain to sensory organs in terms of dark photons so that the sensory percepts consist of standardized mental images - being more like an artworks emphasizing important features rather than a faithful representation of reality.

The findings of about hypnosis can be used also to test the proposed view about hypnosis. As the abstract concludes, color experience is not purely the result of bottom-up processing but can be modulated by top-down factors. In TGD framework this reflects the basic difference between standard neuroscience and TGD deriving from two assumptions.

- Sensory organs are carriers of primary qualia - the phenomenal experience.
- Brain is manufacturer of sensory and memory representations decomposing perceptive field to standardized mental images representing objects and naming them. Virtual sensory input is used to achieve this.

In the experiments the form-color correlation created by hypnotic suggestion could be in conflict with the real visual input. The other subject person sensitive to hypnosis managed to transform the real color percept to a percept consistent with the suggestion. The other subject person also sensitive to hypnotic suggestions reported that his/her eyes and brain "saw" different colors.

In TGD Universe the interpretation would be that magnetic body and brain below it in the self hierarchy imagined the correlation consistent with the suggested one in both case. The imagined color was produced by a virtual sensory input realized as dark photons propagating down from magnetic body to cortex and to the lower levels of brain. This applies to imagination in general. For the sensory imagination the propagation halts before reaching sensory organ - now retina. For hallucinations this halting does not happen. Hypnotic suggestion can prevent this halting so that imagined color transforms to a hallucinated color. This happened for the first subject in the experiments. The second subject experienced both the real color and possibly conflicting imagined color associated with the virtual sensory input halting to some higher level in brain between visual cortex and retina. Note that this serves as evidence for the notion of self hierarchy, which is a basic prediction of TGD inspired theory of consciousness.

Also a comment about time scales involved is in order. The peak in the EEG of the person, who experienced the suggested color-shape correlation appeared after an average time of $T = .1$ seconds from the visual input. T corresponds to 10 Hz fundamental bio-rhythm and the chronon of sensory experience. In TGD framework T characterizes the scale of causal diamond (CD) defining the spotlight of consciousness assignable also to sensory percepts. That T is also the secondary p-adic length scale assigned with electron in TGD conforms with the proposal that electron Cooper pairs play a central role in sensory perception. Primary and secondary p-adic length and time scales (the latter are macroscopic) characterizing elementary particles represents new physics predicted by TGD. $R = .05$ seconds corresponds to distance $R = cT = 15$ Mm, which is more than twice the radius of Earth equal to 6.4 Mm. Hence a signal propagating with velocity of light could travel to a layer of magnetic body with this size and back during time .1 seconds.

After having received the announcement of Finnish academy and before seeing the abstract of the article, my own guess was that the high-frequency EEG refers to 40 Hz thalamo-cortical resonance studied by Antti Revonsuo - one of the authors of the recent work. I was wrong. What Revonsuo found was that 40 Hz resonance does *not* serve as a correlate of mental image as conjectured by Crick and Koch but for the emergence of a new mental image. What was studied was a situation in which the subject person experienced the emergence of 3-D geometric pattern from a chaotic set of dots and lines. 40 Hz activity accompanied only the eureka period: a possible TGD inspired interpretation is that the direct eureka experience was transformed to a memory, which did not generate 40 Hz activity. The 20 Hz activity involved with the change of the perceived color to the suggested color would also correspond to similar re-organization of the perceptive field induced by virtual sensory input masking the real one. What is interesting is that 10,20,40, 80 Hz frequencies appear as resonances in EEG and that they are octaves of 10 Hz. TGD indeed strongly suggests that preferred CD scales come as octaves. Primary p-adic length scales in turn would come as half octaves.

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